NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328

Preliminary charts based on best available information

7,848,328	Imagine Learning ("Accused Instrumentality")
1. A method comprising: mapping, with at least one processor, each of a plurality of data streams related to a specific content to a different component of a service delivering multiple versions of the specific content;	The defendant streams videos making use of HTTP live streaming (HLS) standard (hereinafter referred to as the standard). Connect with your local expert! Pricing, demos, and product information GET STARTED imagine learning ABOUT PRODUCTS OUTCOMES FUNDING COVID-19 RESOURCES SUPPORT SALES LO reimagine THE EDTECH AWARDS COOL TOOL WINNER 2021 https://www.imaginelearning.com/

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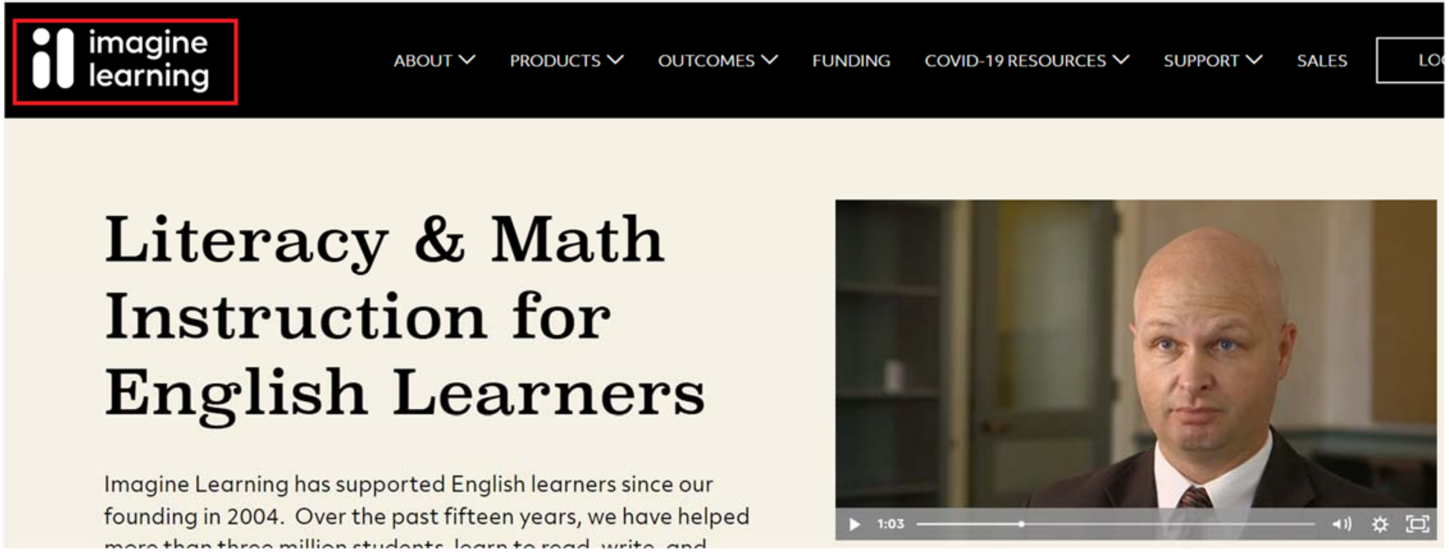
7,848,328	Imagine Learning ("Accused Instrumentality")
	 imagine learning ABOUT PRODUCTS OUTCOMES FUNDING COVID-19 RESOURCES SUPPORT SALES LO 1:03 Literacy & Math Instruction for English Learners Imagine Learning has supported English learners since our founding in 2004. Over the past fifteen years, we have helped more than three million students learn to read, write, and https://www.imaginelearning.com/english-learners The accused standard discloses a method which comprises mapping, with at least one processor (e.g., processor/transcoder of a server of an HLS service provider), each of a plurality of data streams (e.g., media streams such as audio, video, captions, etc.) related to a specific content (e.g., streaming content such as web streaming, on-demand news) to a different component (e.g., Index file m3u8) of a service (e.g., web streaming, on-demand news etc.) delivering multiple versions (e.g., M3U8 Manifest File comprises multiple versions of a data stream) of the specific content (e.g., streaming content such as web streaming, on-demand news etc.). As shown below, a server of an HLS service provider converts plurality of data streams such as audio, video, etc. of a streaming content (e.g., specific content) in multiple streams at different bitrates and resolutions in different media segments of a M3U8 Manifest File. For example a media segment may consist of representation of videos and audios. Similarly, different media segments contain many different representations.

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	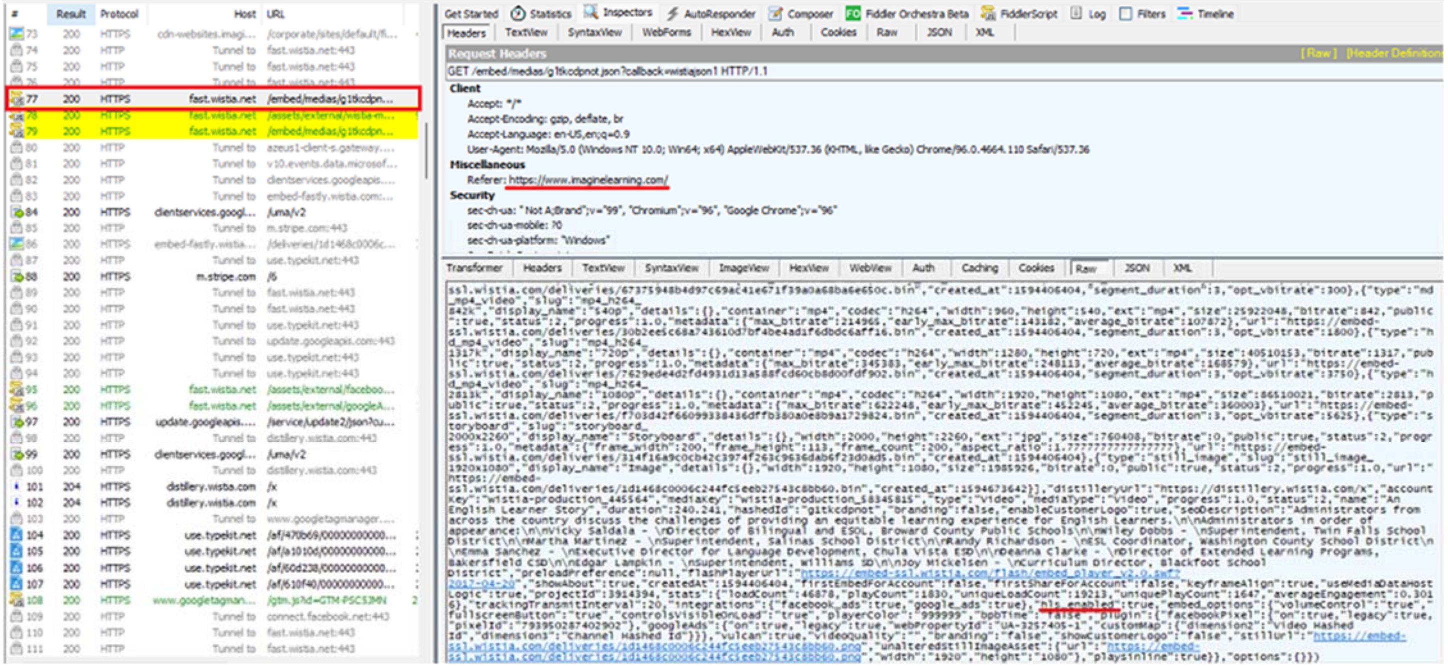

#	Result	Protocol	Host	URL
73	200	HTTPS	cdn-websites.imagi...	/corporate/sites/default/fi...
74	200	HTTP	Tunnel to	fast.wistia.net:443
75	200	HTTP	Tunnel to	fast.wistia.net:443
76	200	HTTP	Tunnel to	fast.wistia.net:443
77	200	HTTPS	fast.wistia.net	/embed/medias/g1tkcdpn...
78	200	HTTPS	fast.wistia.net	/assets/external/wistia-m...
79	200	HTTPS	fast.wistia.net	/embed/medias/g1tkcdpn...
80	200	HTTP	Tunnel to	azeus1-client-s.gateway....
81	200	HTTP	Tunnel to	v10.events.data.microsof...
82	200	HTTP	Tunnel to	clientservices.googleapis....
83	200	HTTP	Tunnel to	embed-fastly.wistia.com:...
84	200	HTTPS	clientservices.googl...	/uma/v2
85	200	HTTP	Tunnel to	m.stripe.com:443
86	200	HTTPS	embed-fastly.wistia...	/deliveries/1d1468c0006c...
87	200	HTTP	Tunnel to	use.typekit.net:443
88	200	HTTPS	m.stripe.com	/6
89	200	HTTP	Tunnel to	fast.wistia.net:443
90	200	HTTP	Tunnel to	fast.wistia.net:443
91	200	HTTP	Tunnel to	use.typekit.net:443
92	200	HTTP	Tunnel to	update.googleapis.com:443
93	200	HTTP	Tunnel to	use.typekit.net:443
94	200	HTTP	Tunnel to	use.typekit.net:443
95	200	HTTPS	fast.wistia.net	/assets/external/faceboo...
96	200	HTTPS	fast.wistia.net	/assets/external/googleA...
97	200	HTTPS	update.googleapis....	/service/update2/json?cu...
98	200	HTTP	Tunnel to	distillery.wistia.com:443
99	200	HTTPS	clientservices.googl...	/uma/v2
100	200	HTTP	Tunnel to	distillery.wistia.com:443
101	204	HTTPS	distillery.wistia.com	/x
102	204	HTTPS	distillery.wistia.com	/x
103	200	HTTP	Tunnel to	www.googletagmanager....
104	200	HTTPS	use.typekit.net	/af/470b69/0000000000...
105	200	HTTPS	use.typekit.net	/af/a1010d/0000000000...
106	200	HTTPS	use.typekit.net	/af/60d238/0000000000...
107	200	HTTPS	use.typekit.net	/af/610f40/0000000000...
108	200	HTTPS	www.googletagman...	/gtm.js?id=GTM-PSC5JMN
109	200	HTTP	Tunnel to	connect.facebook.net:443
110	200	HTTP	Tunnel to	fast.wistia.net:443
111	200	HTTP	Tunnel to	fast.wistia.net:443

```
GET /embed/medias/g1tkcdpnot.json?callback=wistiajson1 HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    sec-ch-ua: "Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
    sec-ch-ua-platform: "Windows"
```

```
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2000x2260","display_name":"Storyboard","details":{},"width":2000,"height":2260,"ext":"jpg","size":760408,"bitrate":0,"public":true,"status":2,"progr
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ssl.wistia.com/deliveries/314f16a9c0cb42c3974f263c9636dab6f23d0ad5.bin","created_at":1594406404},{"type":"still_image","slug":"still_image_
1920x1080","display_name":"Image","details":{},"width":1920,"height":1080,"size":1985926,"bitrate":0,"public":true,"status":2,"progress":1.0,"url":"
https://embed-
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English Learner Story","duration":240.241,"hashedId":"g1tkcdpnot","branding":false,"enableCustomerLogo":true,"seoDescription":"Administrators from
across the country discuss the challenges of providing an equitable learning experience for English Learners.\n\nAdministrators in order of
appearance:\n\nVicky Saldala - \nDirector of Bilingual and ESOL, Broward County Public Schools\n\nWiley Dobbs - \nSuperintendent, Twin Falls School
District\n\nMartha Martinez - \nSuperintendent, Salinas School District\n\nRandy Richardson - \nESL Coordinator, Washington County School District\n
\nEmma Sanchez - \nExecutive Director for Language Development, Chula Vista ESD\n\nDeanna Clarke - \nDirector of Extended Learning Programs,
Bakersfield CSD\n\nEdgar Lampkin - \nSuperintendent, Williams SD\n\nJoy Mickelsen - \nCurriculum Director, Blackfoot School
District","preloadPreference":null,"flashPlayerUrl":"https://embed-ssl.wistia.com/flash/embed_player_v2.0.swf?
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6},"trackingTransmitInterval":20,"integrations":{"facebook_ads":true,"google_ads":true},"hls_enabled":true,"embed_options":{"volumeControl":"true","
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"pixelId":"793950287402902"},"googleAds":{"on":true,"legacy":true,"webPropertyId":"UA-3257405-1","customMap":{"dimension2":"Video Hashed
Id","dimension3":"Channel Hashed Id"}}},"vulcan":true,"videoQuality":"","branding":"false","showCustomerLogo":"false","stillUrl":"https://embed-
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ssl.wistia.com/deliveries/1d1468c0006c244fc5eeb27543c8bb60.png","width":"1920","height":"1080"},"playsinline":true}},"options":{}})
```

Source: Packet capture by Fiddler tool

As shown below, a server of an HLS streaming service provider converts plurality of data streams such as audio, video, etc. of a streaming content (e.g., specific content) such as an entertainment news in multiple versions in different adaptation sets of a M3U8 Manifest File. For example, an adaption set may consist of representation of different resolutions 640x360 video, 400x224 video, etc.

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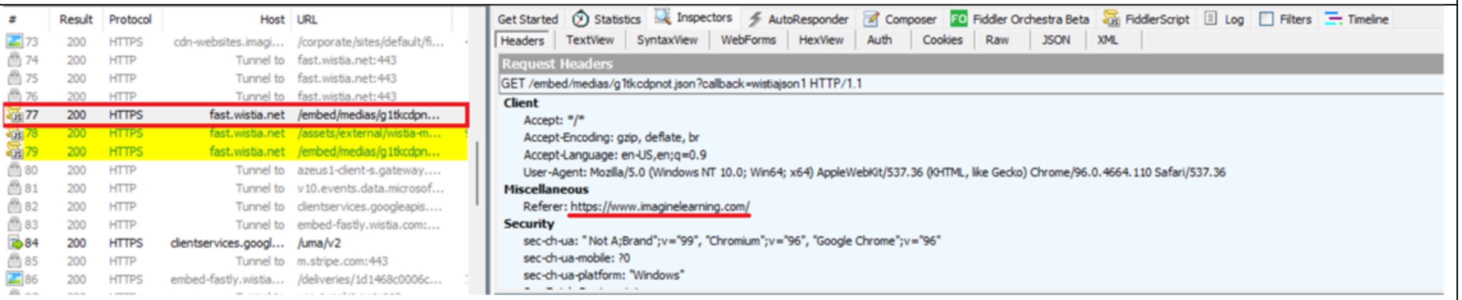
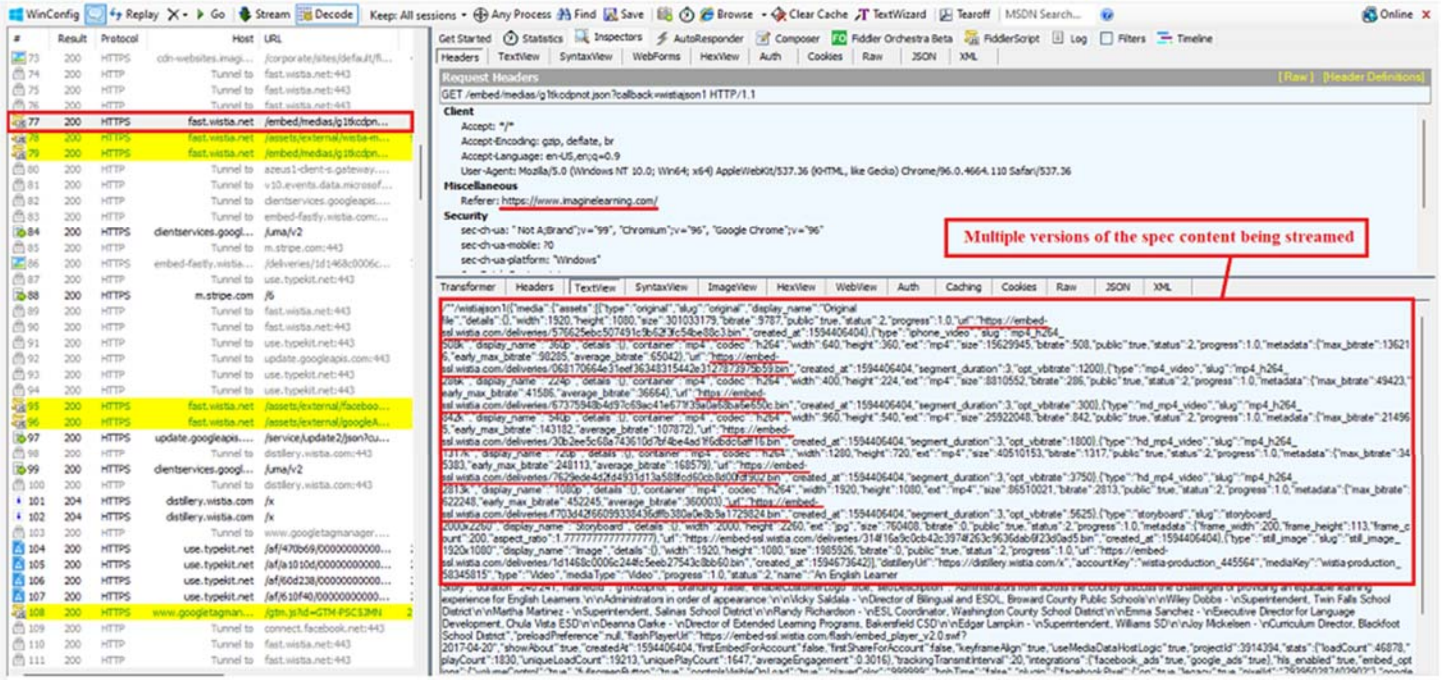
	 *Source: Packet capture by Fiddler tool*  Multiple versions of the spec content being streamed

```
#     Result  Protocol  Host                      URL
73    200     HTTPS     cdn-websites.imagi...     /corporate/sites/default/fi...
74    200     HTTP      Tunnel to                 fast.wistia.net:443
75    200     HTTP      Tunnel to                 fast.wistia.net:443
76    200     HTTP      Tunnel to                 fast.wistia.net:443
77    200     HTTPS     fast.wistia.net           /embed/medias/g1tkcdpn...
78    200     HTTPS     fast.wistia.net           /assets/external/wistia-m...
79    200     HTTPS     fast.wistia.net           /embed/medias/g1tkcdpn...
80    200     HTTP      Tunnel to                 azeus1-client-s.gateway....
81    200     HTTP      Tunnel to                 v10.events.data.microsof...
82    200     HTTP      Tunnel to                 clientservices.googleapis....
83    200     HTTP      Tunnel to                 embed-fastly.wistia.com:...
84    200     HTTPS     clientservices.googl...   /uma/v2
85    200     HTTP      Tunnel to                 m.stripe.com:443
86    200     HTTPS     embed-fastly.wistia...    /deliveries/1d1468c0006c...
87    200     HTTP      Tunnel to                 use.typekit.net:443
88    200     HTTPS     m.stripe.com              /6
89    200     HTTP      Tunnel to                 fast.wistia.net:443
90    200     HTTP      Tunnel to                 fast.wistia.net:443
91    200     HTTP      Tunnel to                 use.typekit.net:443
92    200     HTTP      Tunnel to                 update.googleapis.com:443
93    200     HTTP      Tunnel to                 use.typekit.net:443
94    200     HTTP      Tunnel to                 use.typekit.net:443
95    200     HTTPS     fast.wistia.net           /assets/external/faceboo...
96    200     HTTPS     fast.wistia.net           /assets/external/googleA...
97    200     HTTPS     update.googleapis....     /service/update2/json?cu...
98    200     HTTP      Tunnel to                 distillery.wistia.com:443
99    200     HTTPS     clientservices.googl...   /uma/v2
100   200     HTTP      Tunnel to                 distillery.wistia.com:443
101   204     HTTPS     distillery.wistia.com     /x
102   204     HTTPS     distillery.wistia.com     /x
103   200     HTTP      Tunnel to                 www.googletagmanager....
104   200     HTTPS     use.typekit.net           /af/470b69/0000000000...
105   200     HTTPS     use.typekit.net           /af/a1010d/0000000000...
106   200     HTTPS     use.typekit.net           /af/60d238/0000000000...
107   200     HTTPS     use.typekit.net           /af/610f40/0000000000...
108   200     HTTPS     www.googletagman...       /gtm.js?id=GTM-P5CSJMN
109   200     HTTP      Tunnel to                 connect.facebook.net:443
110   200     HTTP      Tunnel to                 fast.wistia.net:443
111   200     HTTP      Tunnel to                 fast.wistia.net:443
```

```
Request Headers
GET /embed/medias/g1tkcdpnot.json?callback=wistiajson1 HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
    sec-ch-ua-platform: "Windows"
```

```
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1317k","display_name":"720p","details":{},"container":"mp4","codec":"h264","width":1280,"height":720,"ext":"mp4","size":40510153,"bitrate":1317,"public":true,"status":2,"progress":1.0,"metadata":{"max_bitrate":34
5383,"early_max_bitrate":248113,"average_bitrate":168579},"url":"https://embed-
ssl.wistia.com/deliveries/7629ede4d2fd4931d13a588fcd60cb8d00fdf902.bin","created_at":1594406404,"segment_duration":3,"opt_vbitrate":3750},{"type":"hd_mp4_video","slug":"mp4_h264_
2813k","display_name":"1080p","details":{},"container":"mp4","codec":"h264","width":1920,"height":1080,"ext":"mp4","size":86510021,"bitrate":2813,"public":true,"status":2,"progress":1.0,"metadata":{"max_bitrate":
622248,"early_max_bitrate":452245,"average_bitrate":360003},"url":"https://embed-
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2000x2260","display_name":"Storyboard","details":{},"width":2000,"height":2260,"ext":"jpg","size":760408,"bitrate":0,"public":true,"status":2,"progress":1.0,"metadata":{"frame_width":200,"frame_height":113,"frame_c
ount":200,"aspect_ratio":1.7777777777777777},"url":"https://embed-ssl.wistia.com/deliveries/314f16a9c0cb42c3974f263c9636dab6f23d0ad5.bin","created_at":1594406404},{"type":"still_image","slug":"still_image_
1920x1080","display_name":"Image","details":{},"width":1920,"height":1080,"size":1985926,"bitrate":0,"public":true,"status":2,"progress":1.0,"url":"https://embed-
ssl.wistia.com/deliveries/1d1468c0006c244fc5eeb27543c8bb60.bin","created_at":1594673642}],"distilleryUrl":"https://distillery.wistia.com/x","accountKey":"wistia-production_445564","mediaKey":"wistia-production_
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experience for English Learners.\n\nAdministrators in order of appearance:\n\nVicky Saldala - \nDirector of Bilingual and ESOL, Broward County Public Schools\n\nWiley Dobbs - \nSuperintendent, Twin Falls School
District\n\nMartha Martinez - \nSuperintendent, Salinas School District\n\nRandy Richardson - \nESL Coordinator, Washington County School District\n\nEmma Sanchez - \nExecutive Director for Language
Development, Chula Vista ESD\n\nDeanna Clarke - \nDirector of Extended Learning Programs, Bakersfield CSD\n\nEdgar Lampkin - \nSuperintendent, Williams SD\n\nJoy Mickelsen - \nCurriculum Director, Blackfoot
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```

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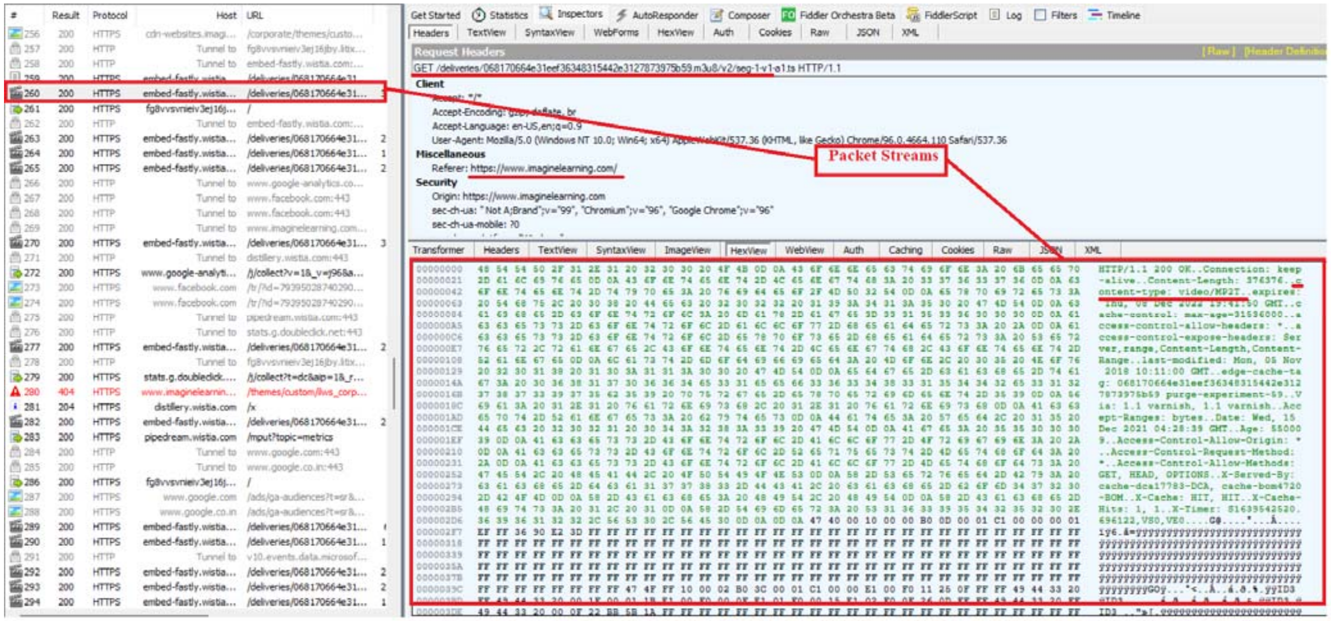


```
#    Result  Protocol  Host                    URL
256  200     HTTPS     cdn-websites.imagi...   /corporate/themes/custo...
257  200     HTTP      Tunnel to               fg8vvsvnieiv3ej16jby.litx...
258  200     HTTP      Tunnel to               embed-fastly.wistia.com:...
259  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...
260  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   3
261  200     HTTPS     fg8vvsvnieiv3ej16j...   /
262  200     HTTP      Tunnel to               embed-fastly.wistia.com:...
263  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
264  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   1
265  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
266  200     HTTP      Tunnel to               www.google-analytics.co...
267  200     HTTP      Tunnel to               www.facebook.com:443
268  200     HTTP      Tunnel to               www.facebook.com:443
269  200     HTTP      Tunnel to               www.imaginelearning.com...
270  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   3
271  200     HTTP      Tunnel to               distillery.wistia.com:443
272  200     HTTPS     www.google-analyti...   /j/collect?v=1&_v=j96&a...
273  200     HTTPS     www.facebook.com        /tr/?id=79395028740290...
274  200     HTTPS     www.facebook.com        /tr/?id=79395028740290...
275  200     HTTP      Tunnel to               pipedream.wistia.com:443
276  200     HTTP      Tunnel to               stats.g.doubleclick.net:443
277  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
278  200     HTTP      Tunnel to               fg8vvsvnieiv3ej16jby.litx...
279  200     HTTPS     stats.g.doubleclick....  /j/collect?t=dc&aip=1&_r...
280  404     HTTPS     www.imaginelearnin...   /themes/custom/ilws_corp...
281  204     HTTPS     distillery.wistia.com   /x
282  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
283  200     HTTPS     pipedream.wistia.com    /mput?topic=metrics
284  200     HTTP      Tunnel to               www.google.com:443
285  200     HTTP      Tunnel to               www.google.co.in:443
286  200     HTTPS     fg8vvsvnieiv3ej16j...   /
287  200     HTTPS     www.google.com          /ads/ga-audiences?t=sr&...
288  200     HTTPS     www.google.co.in        /ads/ga-audiences?t=sr&...
289  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   (
290  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   1
291  200     HTTP      Tunnel to               v10.events.data.microsof...
292  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
293  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   2
294  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...   1
```

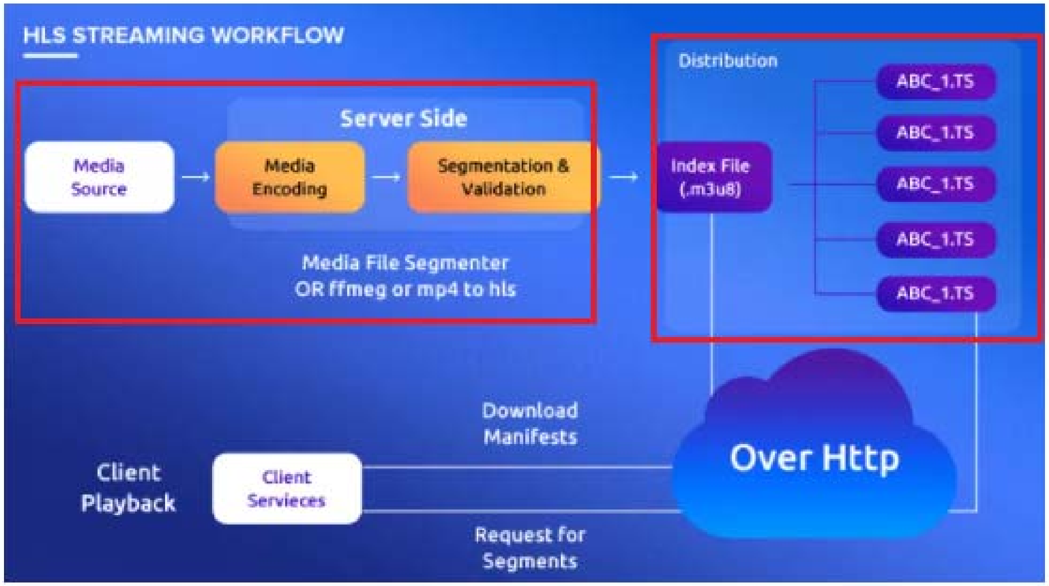
```
Request Headers
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    Origin: https://www.imaginelearning.com
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
```

```
00000000  48 54 54 50 2F 31 2E 31 20 32 30 30 20 4F 4B 0D 0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 6B 65 65 70  HTTP/1.1 200 OK..Connection: keep
00000021  2D 61 6C 69 76 65 0D 0A 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 3A 20 33 37 36 33 37 36 0D 0A 63  -alive..Content-Length: 376376..c
00000042  6F 6E 74 65 6E 74 2D 74 79 70 65 3A 20 76 69 64 65 6F 2F 4D 50 32 54 0D 0A 65 78 70 69 72 65 73 3A  ontent-type: video/MP2T..expires:
00000063  20 54 68 75 2C 20 30 38 20 44 65 63 20 32 30 32 32 20 31 39 3A 34 31 3A 35 30 20 47 4D 54 0D 0A 63   Thu, 08 Dec 2022 19:41:50 GMT..c
00000084  61 63 68 65 2D 63 6F 6E 74 72 6F 6C 3A 20 6D 61 78 2D 61 67 65 3D 33 31 35 33 36 30 30 30 0D 0A 61  ache-control: max-age=31536000..a
000000A5  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 61 6C 6C 6F 77 2D 68 65 61 64 65 72 73 3A 20 2A 0D 0A 61  ccess-control-allow-headers: *..a
000000C6  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 65 78 70 6F 73 65 2D 68 65 61 64 65 72 73 3A 20 53 65 72  ccess-control-expose-headers: Ser
000000E7  76 65 72 2C 72 61 6E 67 65 2C 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 2C 43 6F 6E 74 65 6E 74 2D  ver,range,Content-Length,Content-
00000108  52 61 6E 67 65 0D 0A 6C 61 73 74 2D 6D 6F 64 69 66 69 65 64 3A 20 4D 6F 6E 2C 20 30 35 20 4E 6F 76  Range..last-modified: Mon, 05 Nov
00000129  20 32 30 31 38 20 31 30 3A 31 31 3A 30 30 20 47 4D 54 0D 0A 65 64 67 65 2D 63 61 63 68 65 2D 74 61   2018 10:11:00 GMT..edge-cache-ta
0000014A  67 3A 20 30 36 38 31 37 30 36 36 34 65 33 31 65 65 66 33 36 33 34 38 33 31 35 34 34 32 65 33 31 32  g: 068170664e31eef36348315442e312
0000016B  37 38 37 33 39 37 35 62 35 39 20 70 75 72 67 65 2D 65 78 70 65 72 69 6D 65 6E 74 2D 35 39 0D 0A 56  7873975b59 purge-experiment-59..V
0000018C  69 61 3A 20 31 2E 31 20 76 61 72 6E 69 73 68 2C 20 31 2E 31 20 76 61 72 6E 69 73 68 0D 0A 41 63 63  ia: 1.1 varnish, 1.1 varnish..Acc
000001AD  65 70 74 2D 52 61 6E 67 65 73 3A 20 62 79 74 65 73 0D 0A 44 61 74 65 3A 20 57 65 64 2C 20 31 35 20  ept-Ranges: bytes..Date: Wed, 15 
000001CE  44 65 63 20 32 30 32 31 20 30 34 3A 32 38 3A 33 39 20 47 4D 54 0D 0A 41 67 65 3A 20 35 35 30 30 30  Dec 2021 04:28:39 GMT..Age: 55000
000001EF  39 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 41 6C 6C 6F 77 2D 4F 72 69 67 69 6E 3A 20 2A  9..Access-Control-Allow-Origin: *
00000210  0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 52 65 71 75 65 73 74 2D 4D 65 74 68 6F 64 3A 20  ..Access-Control-Request-Method: 
00000231  2A 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 41 6C 6C 6F 77 2D 4D 65 74 68 6F 64 73 3A 20  *..Access-Control-Allow-Methods: 
00000252  47 45 54 2C 20 48 45 41 44 2C 20 4F 50 54 49 4F 4E 53 0D 0A 58 2D 53 65 72 76 65 64 2D 42 79 3A 20  GET, HEAD, OPTIONS..X-Served-By: 
00000273  63 61 63 68 65 2D 64 63 61 31 37 37 38 33 2D 44 43 41 2C 20 63 61 63 68 65 2D 62 6F 6D 34 37 32 30  cache-dca17783-DCA, cache-bom4720
00000294  2D 42 4F 4D 0D 0A 58 2D 43 61 63 68 65 3A 20 48 49 54 2C 20 48 49 54 0D 0A 58 2D 43 61 63 68 65 2D  -BOM..X-Cache: HIT, HIT..X-Cache-
000002B5  48 69 74 73 3A 20 31 2C 20 31 0D 0A 58 2D 54 69 6D 65 72 3A 20 53 31 36 33 39 35 34 32 35 32 30 2E  Hits: 1, 1..X-Timer: S1639542520.
000002D6  36 39 36 31 32 32 2C 56 53 30 2C 56 45 30 0D 0A 0D 0A 47 40 00 10 00 00 B0 0D 00 01 C1 00 00 00 01  696122,VS0,VE0....G@....°...Á....
000002F7  EF FF 36 90 E2 3D FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ïÿ6.â=ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
00000318  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
00000339  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
0000035A  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
0000037B  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
0000039C  FF FF FF FF FF FF FF FF 47 4F FF 10 00 02 B0 3C 00 01 C1 00 00 E1 00 F0 11 25 0F FF FF 49 44 33 20  ÿÿÿÿÿÿÿÿGOÿ...°<..Á..á.ð.%.ÿÿID3 
000003BD  FF 49 44 33 20 00 1F 00 01 1B E1 00 F0 00 0F E1 01 F0 00 15 E1 02 F0 0F 26 0D FF FF 49 44 33 20 FF  ÿID3 .....á.ð..á.ð..á.ð.&.ÿÿID3 ÿ
000003DE  49 44 33 20 00 0F 22 BB 5B 1A FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ID3 .."»[.ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
```

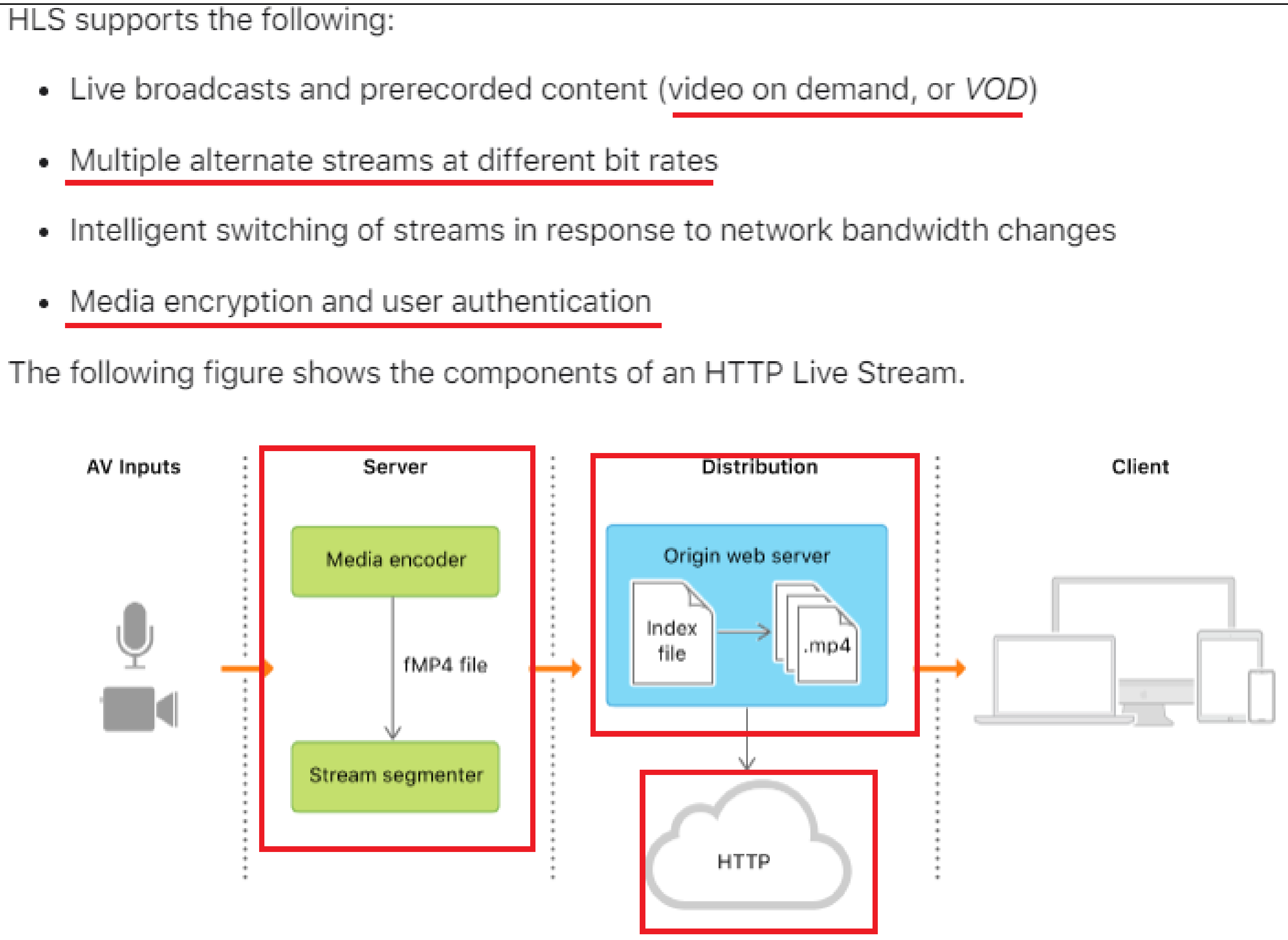
Source: Packet capture by Fiddler tool

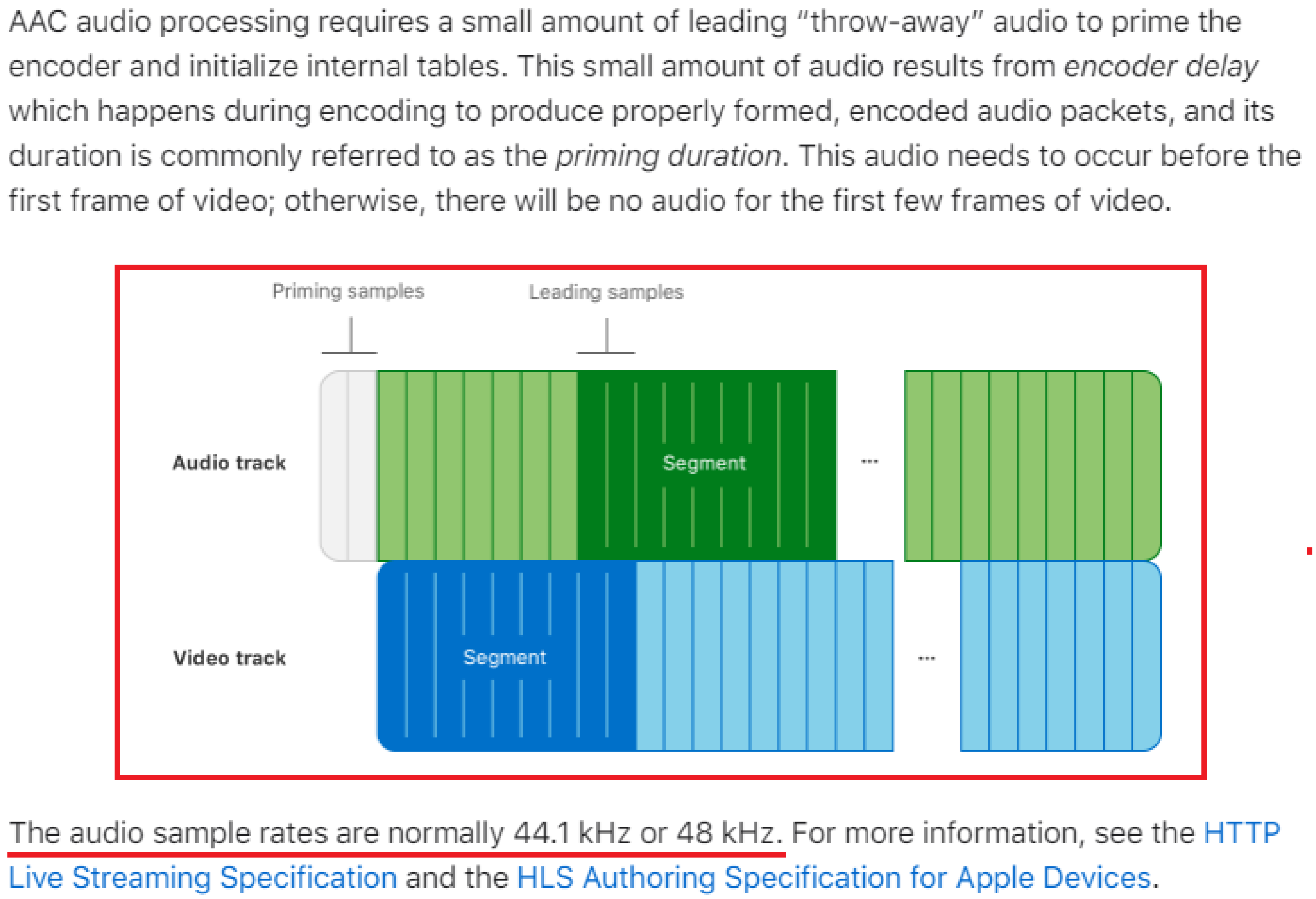
NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328

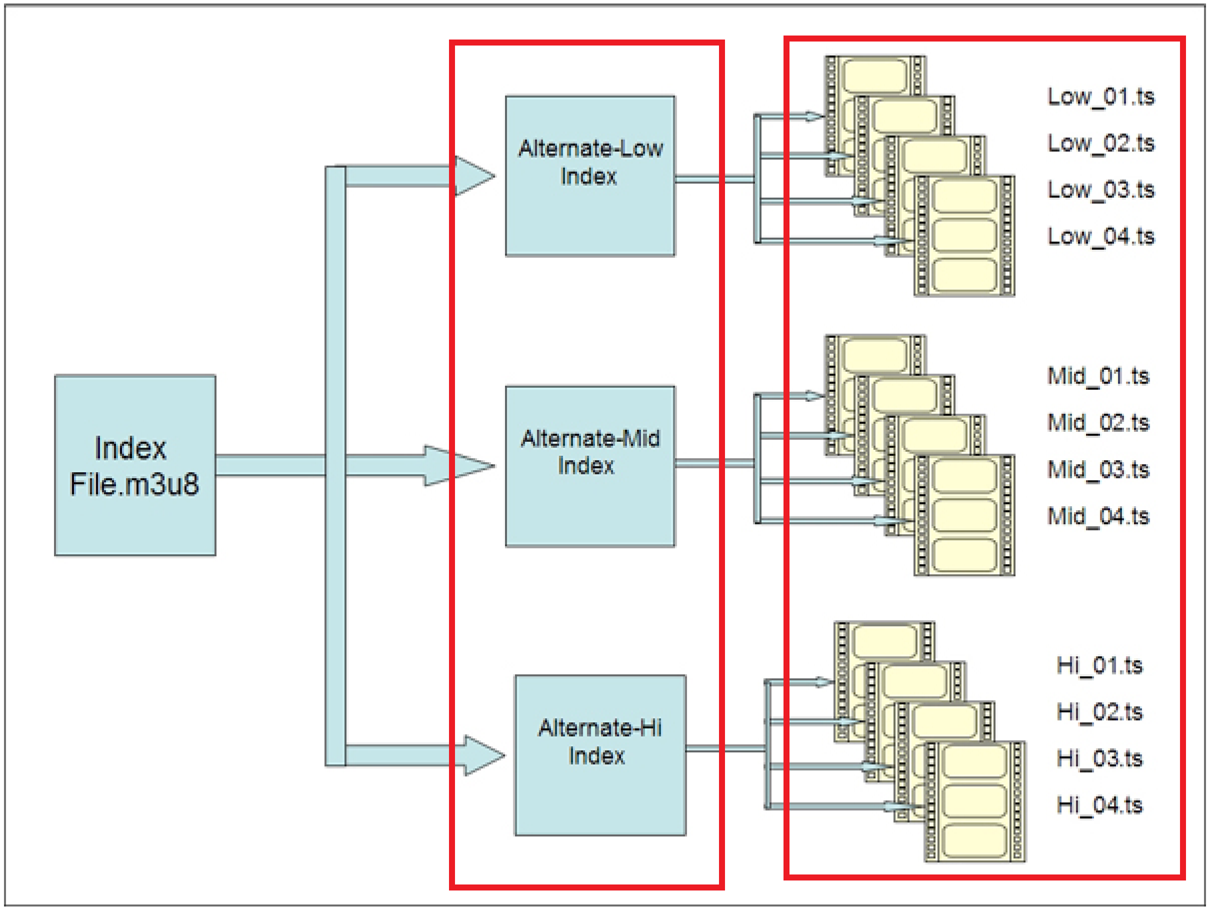
Preliminary charts based on best available information

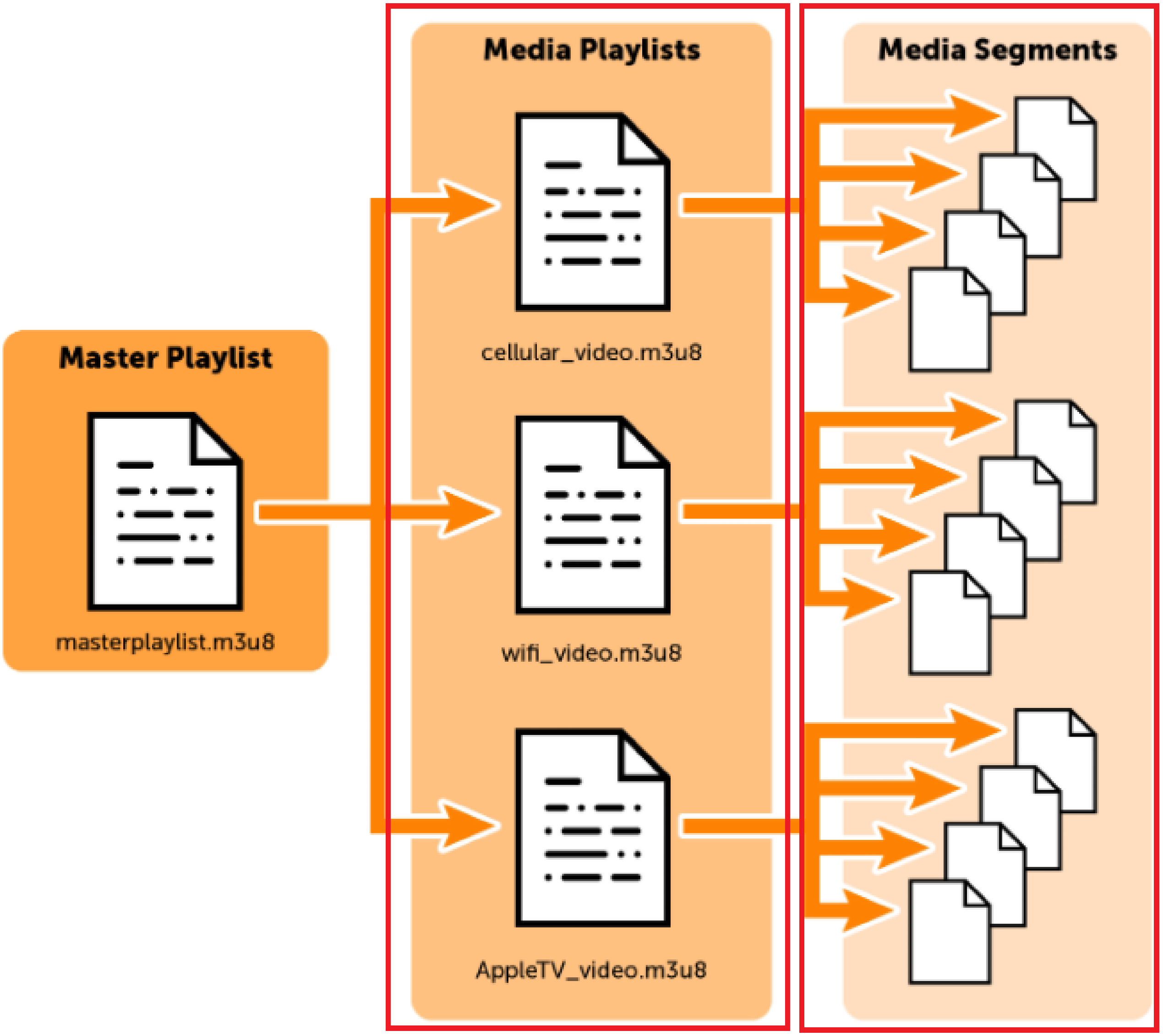
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 HLS STREAMING WORKFLOW Server Side Media Source Media Encoding Segmentation & Validation Media File Segmenter OR ffmeg or mp4 to hls Distribution Index File (.m3u8) ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS Download Manifests Over Http Client Playback Client Servieces Request for Segments https://martech.zone/http-live-streaming-player-features/

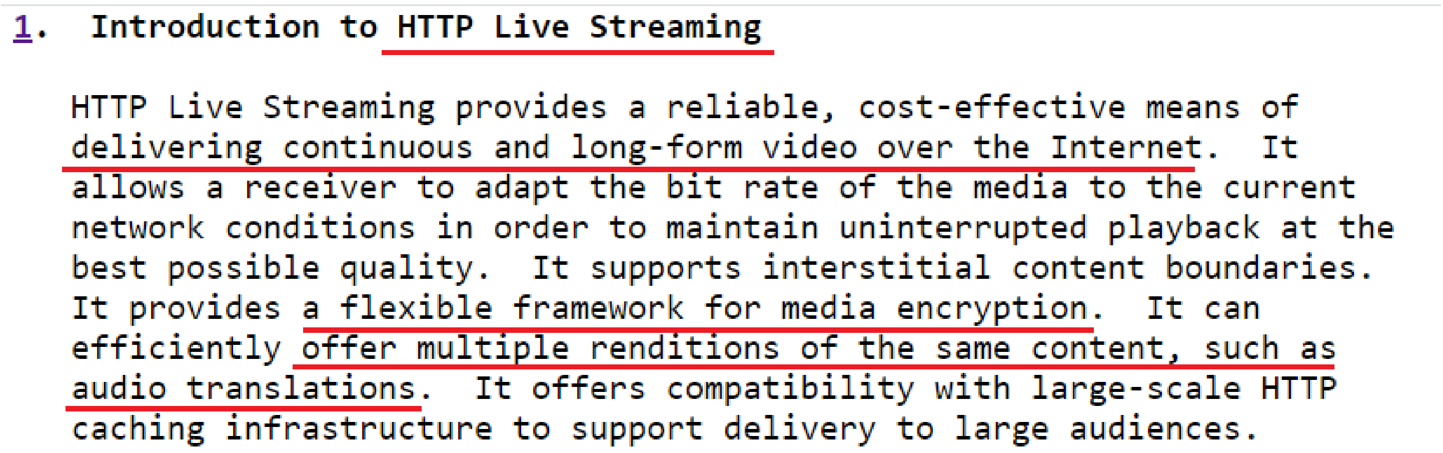
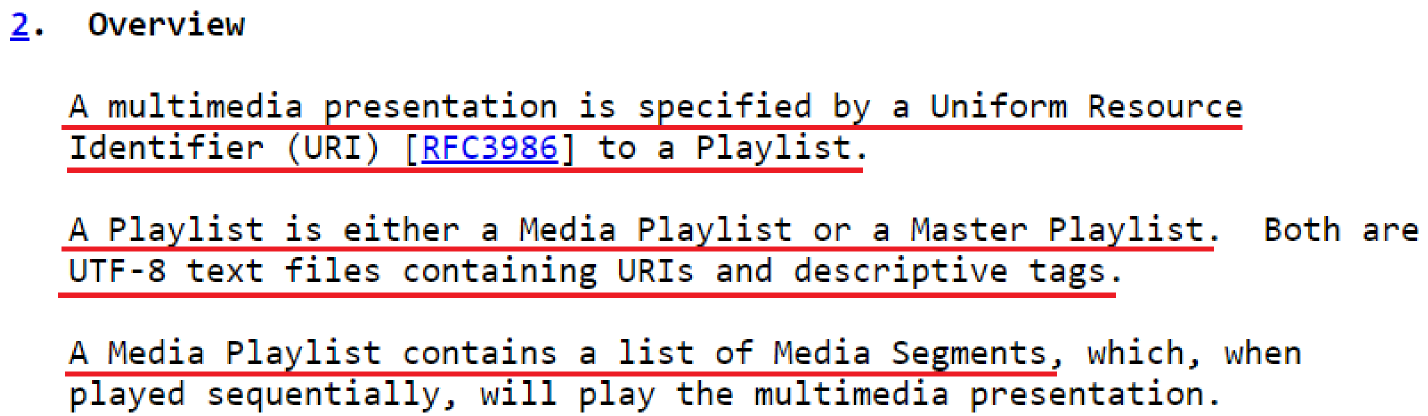
Preliminary charts based on best available information

7,848,328	Imagine Learning ("Accused Instrumentality")
	 HLS supports the following: - Live broadcasts and prerecorded content (video on demand, or *VOD*) - Multiple alternate streams at different bit rates - Intelligent switching of streams in response to network bandwidth changes - Media encryption and user authentication The following figure shows the components of an HTTP Live Stream. AV Inputs Server Media encoder fMP4 file Stream segmenter Distribution Origin web server Index file .mp4 HTTP Client https://developer.apple.com/documentation/http_live_streaming

7,848,328	Imagine Learning ("Accused Instrumentality")
	 AAC audio processing requires a small amount of leading "throw-away" audio to prime the encoder and initialize internal tables. This small amount of audio results from *encoder delay* which happens during encoding to produce properly formed, encoded audio packets, and its duration is commonly referred to as the *priming duration*. This audio needs to occur before the first frame of video; otherwise, there will be no audio for the first few frames of video. Priming samples Leading samples Audio track Segment Video track Segment The audio sample rates are normally 44.1 kHz or 48 kHz. For more information, see the HTTP Live Streaming Specification and the HLS Authoring Specification for Apple Devices. https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming

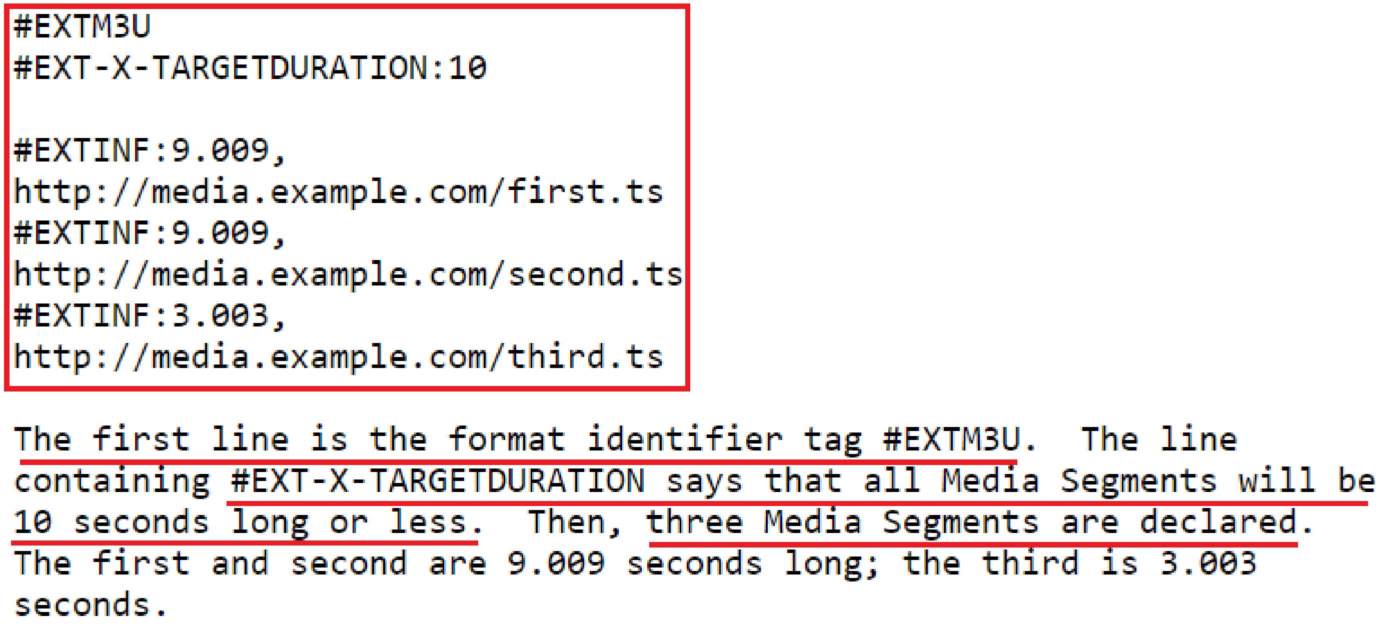
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 Index File.m3u8 Alternate-Low Index Alternate-Mid Index Alternate-Hi Index Low_01.ts Low_02.ts Low_03.ts Low_04.ts Mid_01.ts Mid_02.ts Mid_03.ts Mid_04.ts Hi_01.ts Hi_02.ts Hi_03.ts Hi_04.ts https://www.streamingmedia.com/Articles/Editorial/What-Is-.../What-Is-HLS-(HTTP-Live-Streaming)-78221.aspx?utm_source=related_articles&utm_medium=gutenberg&utm_campaign=editors_selection

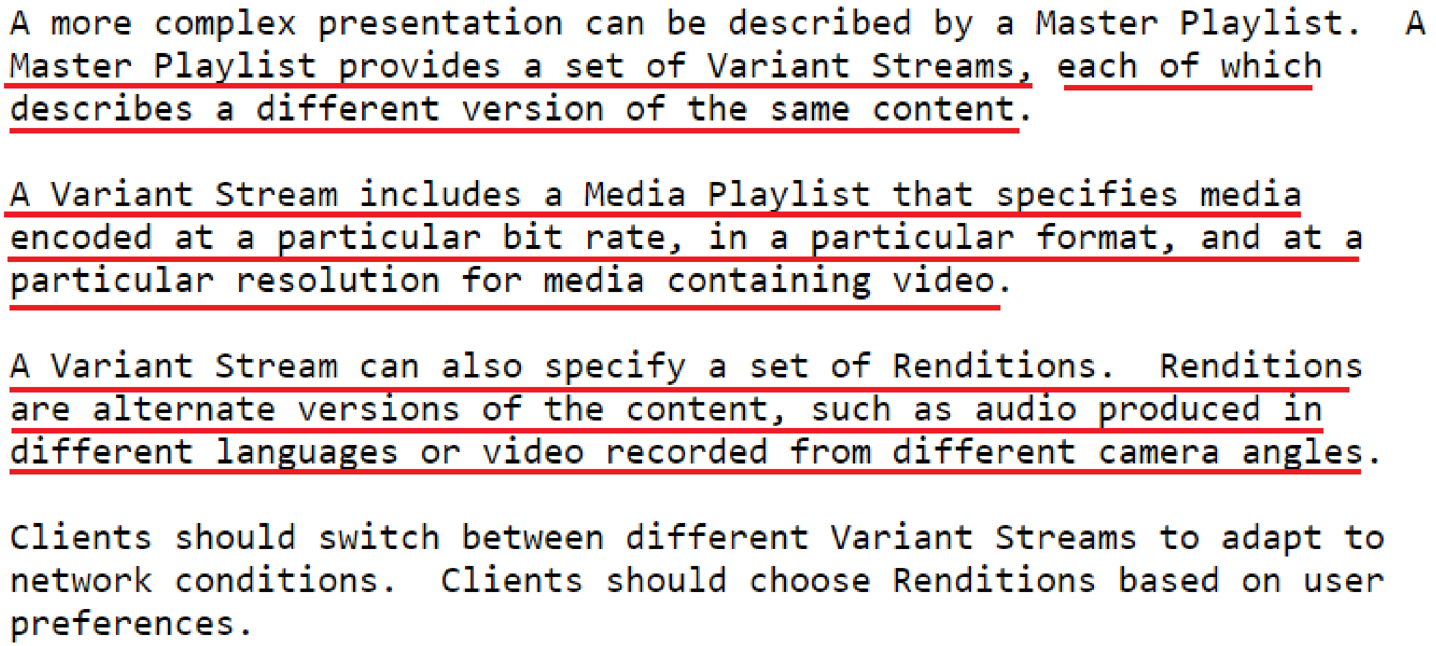
	 Master Playlist masterplaylist.m3u8 Media Playlists cellular_video.m3u8 wifi_video.m3u8 AppleTV_video.m3u8 Media Segments https://www.wowza.com/blog/hls-streaming-protocol

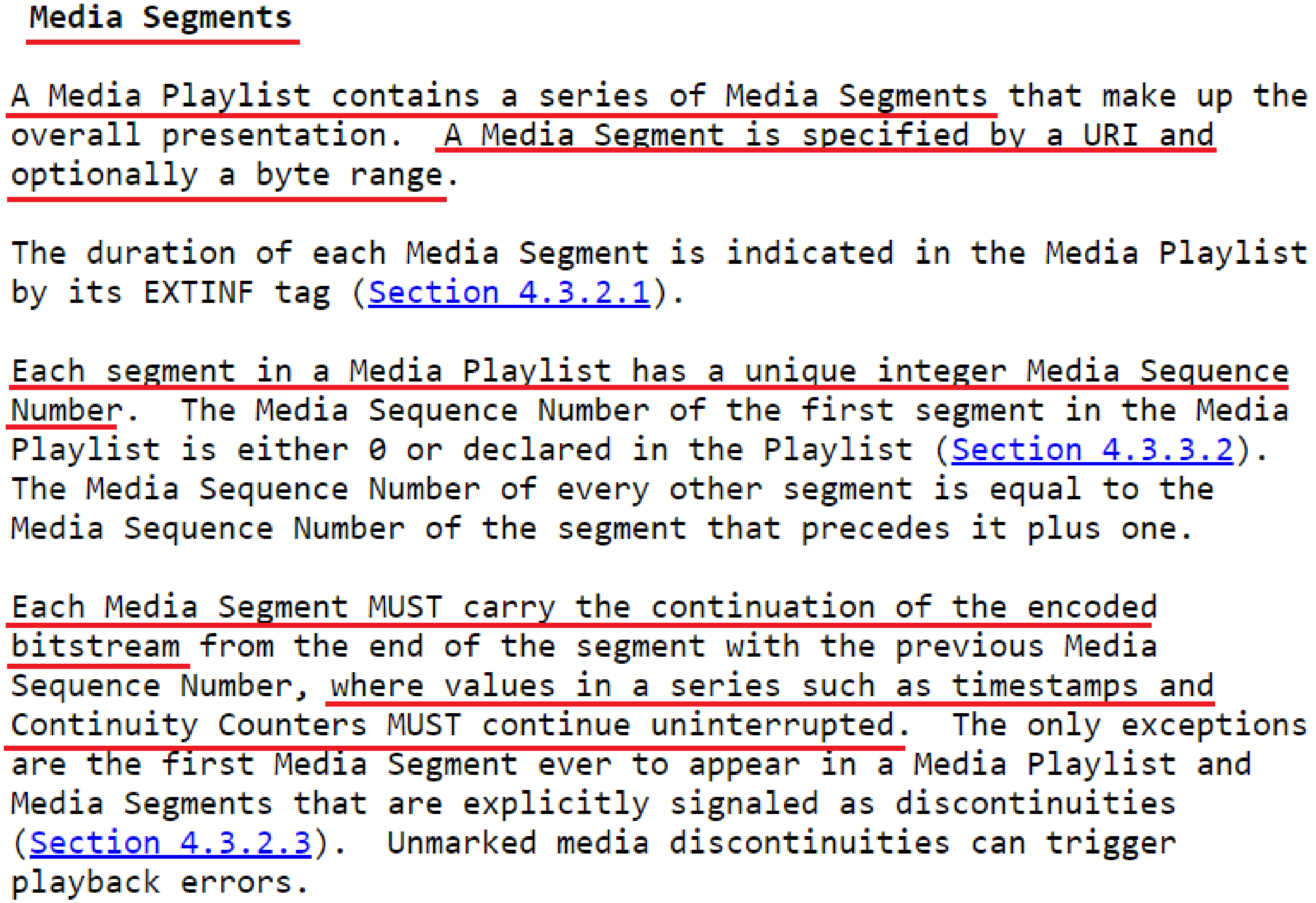
7,848,328	Imagine Learning ("Accused Instrumentality")
	 1. Introduction to HTTP Live Streaming HTTP Live Streaming provides a reliable, cost-effective means of delivering continuous and long-form video over the Internet. It allows a receiver to adapt the bit rate of the media to the current network conditions in order to maintain uninterrupted playback at the best possible quality. It supports interstitial content boundaries. It provides a flexible framework for media encryption. It can efficiently offer multiple renditions of the same content, such as audio translations. It offers compatibility with large-scale HTTP caching infrastructure to support delivery to large audiences. https://datatracker.ietf.org/doc/html/rfc8216#section-1  2. Overview A multimedia presentation is specified by a Uniform Resource Identifier (URI) [RFC3986] to a Playlist. A Playlist is either a Media Playlist or a Master Playlist. Both are UTF-8 text files containing URIs and descriptive tags. A Media Playlist contains a list of Media Segments, which, when played sequentially, will play the multimedia presentation. https://datatracker.ietf.org/doc/html/rfc8216

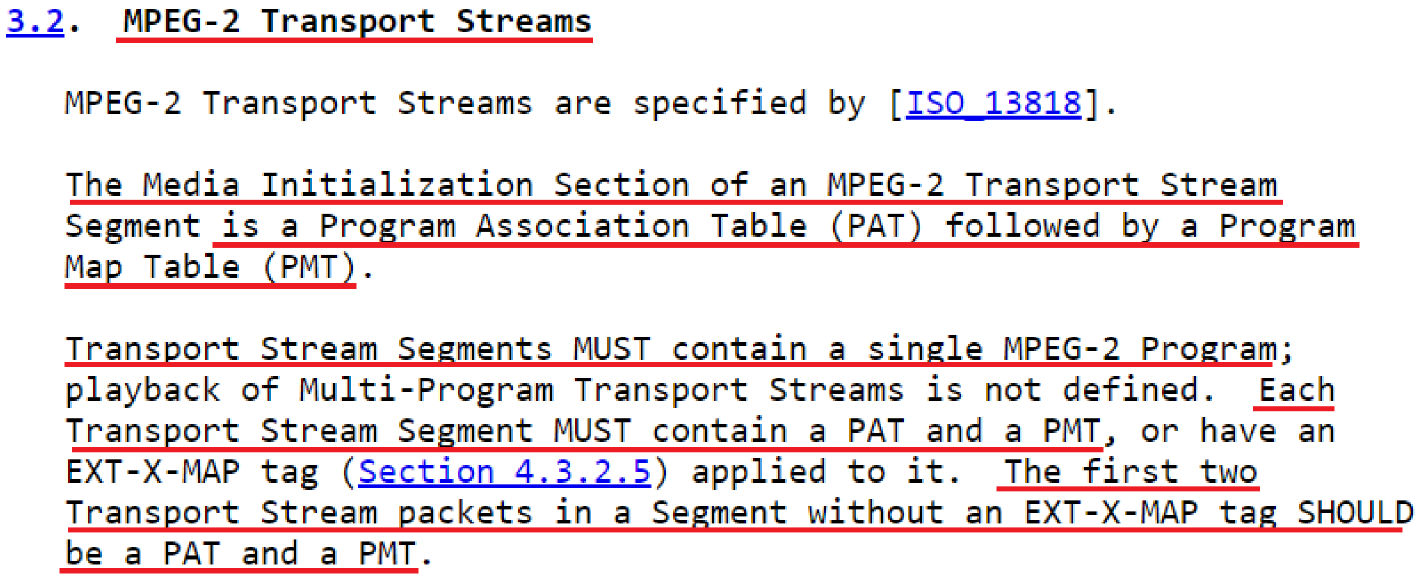
NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328

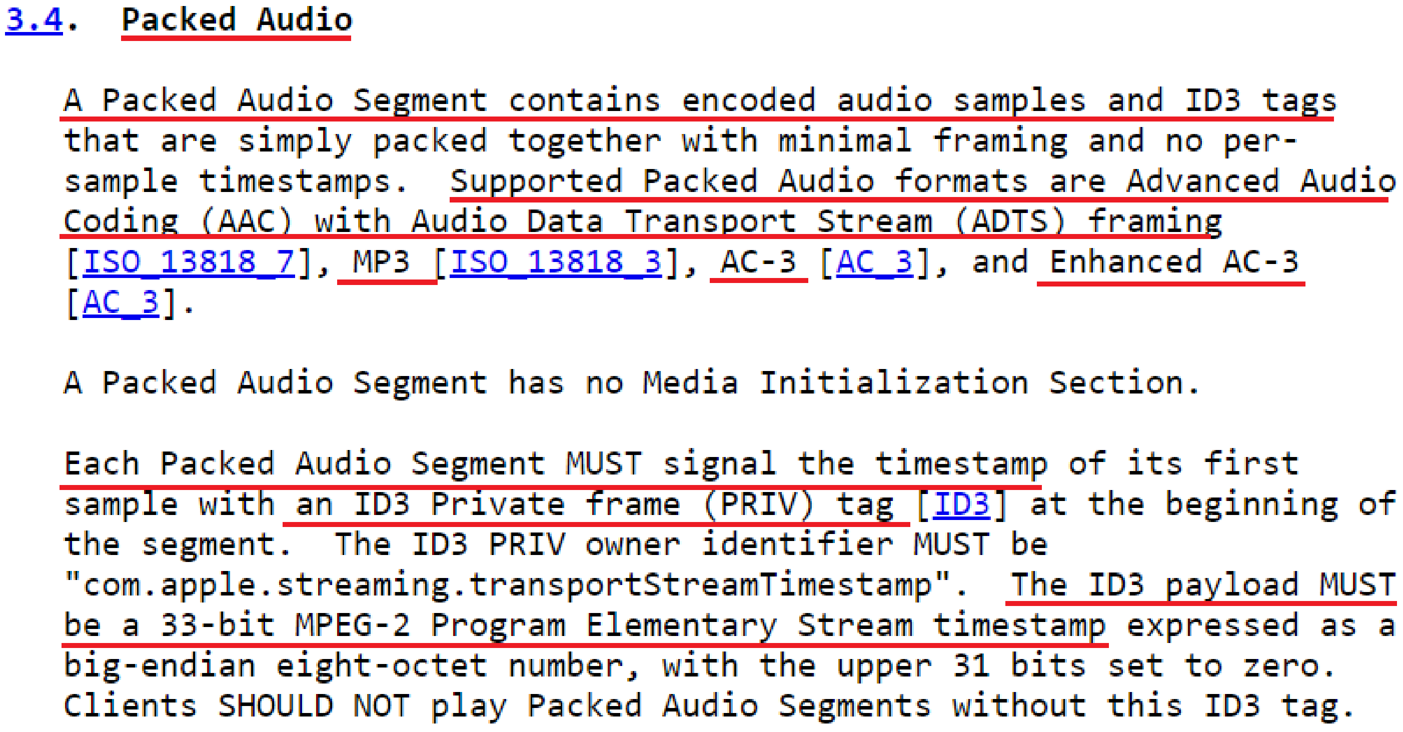
Preliminary charts based on best available information

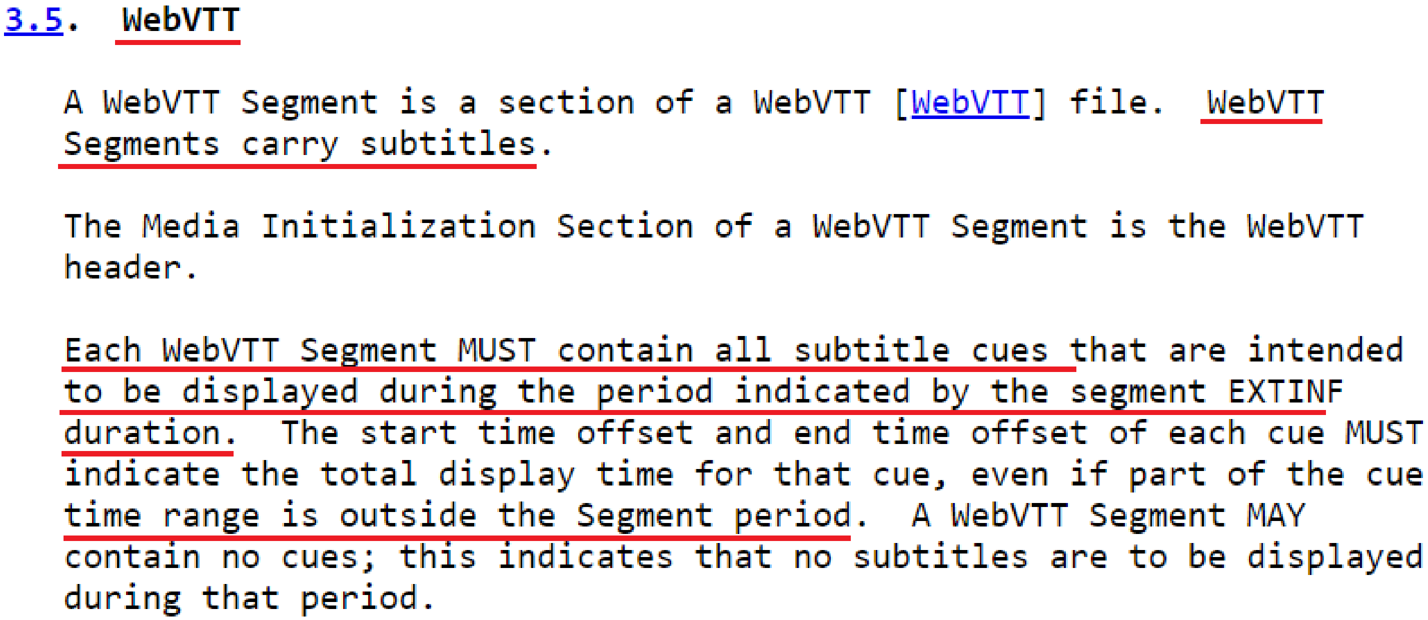
7,848,328	Imagine Learning ("Accused Instrumentality")
	 #EXTM3U #EXT-X-TARGETDURATION:10 #EXTINF:9.009, http://media.example.com/first.ts #EXTINF:9.009, http://media.example.com/second.ts #EXTINF:3.003, http://media.example.com/third.ts The first line is the format identifier tag #EXTM3U. The line containing #EXT-X-TARGETDURATION says that all Media Segments will be 10 seconds long or less. Then, three Media Segments are declared. The first and second are 9.009 seconds long; the third is 3.003 seconds. https://datatracker.ietf.org/doc/html/rfc8216

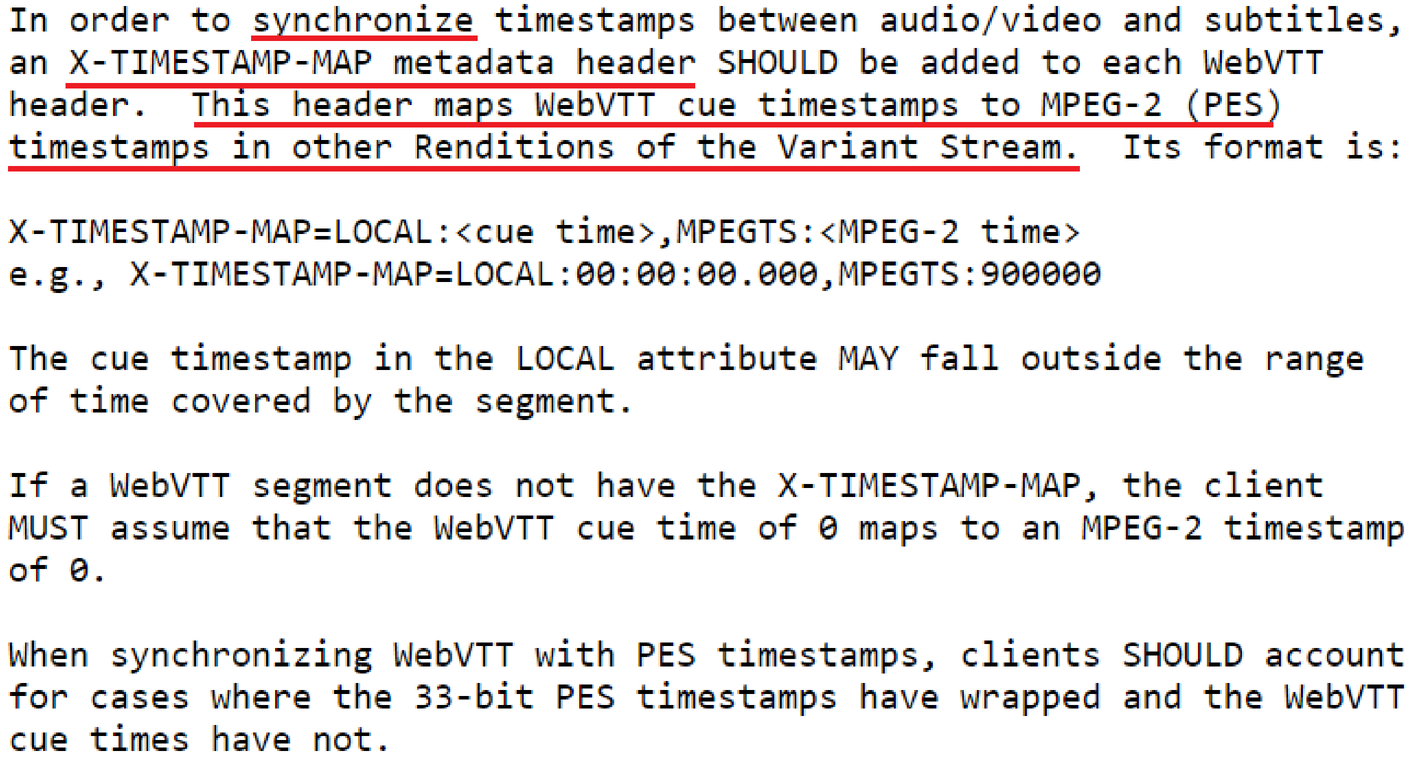
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 A more complex presentation can be described by a Master Playlist. A Master Playlist provides a set of Variant Streams, each of which describes a different version of the same content. A Variant Stream includes a Media Playlist that specifies media encoded at a particular bit rate, in a particular format, and at a particular resolution for media containing video. A Variant Stream can also specify a set of Renditions. Renditions are alternate versions of the content, such as audio produced in different languages or video recorded from different camera angles. Clients should switch between different Variant Streams to adapt to network conditions. Clients should choose Renditions based on user preferences. https://datatracker.ietf.org/doc/html/rfc8216

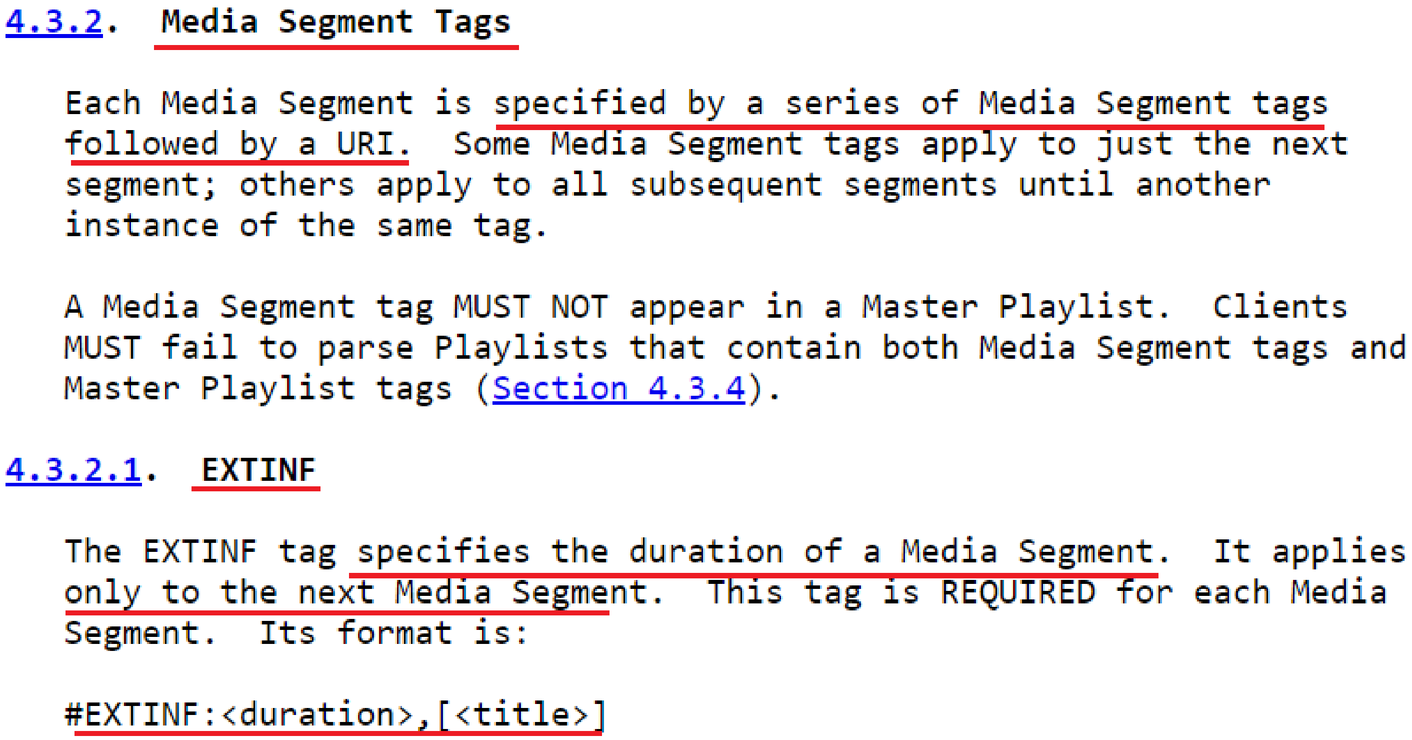
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 **Media Segments** A Media Playlist contains a series of Media Segments that make up the overall presentation. A Media Segment is specified by a URI and optionally a byte range. The duration of each Media Segment is indicated in the Media Playlist by its EXTINF tag (Section 4.3.2.1). Each segment in a Media Playlist has a unique integer Media Sequence Number. The Media Sequence Number of the first segment in the Media Playlist is either 0 or declared in the Playlist (Section 4.3.3.2). The Media Sequence Number of every other segment is equal to the Media Sequence Number of the segment that precedes it plus one. Each Media Segment MUST carry the continuation of the encoded bitstream from the end of the segment with the previous Media Sequence Number, where values in a series such as timestamps and Continuity Counters MUST continue uninterrupted. The only exceptions are the first Media Segment ever to appear in a Media Playlist and Media Segments that are explicitly signaled as discontinuities (Section 4.3.2.3). Unmarked media discontinuities can trigger playback errors. https://datatracker.ietf.org/doc/html/rfc8216

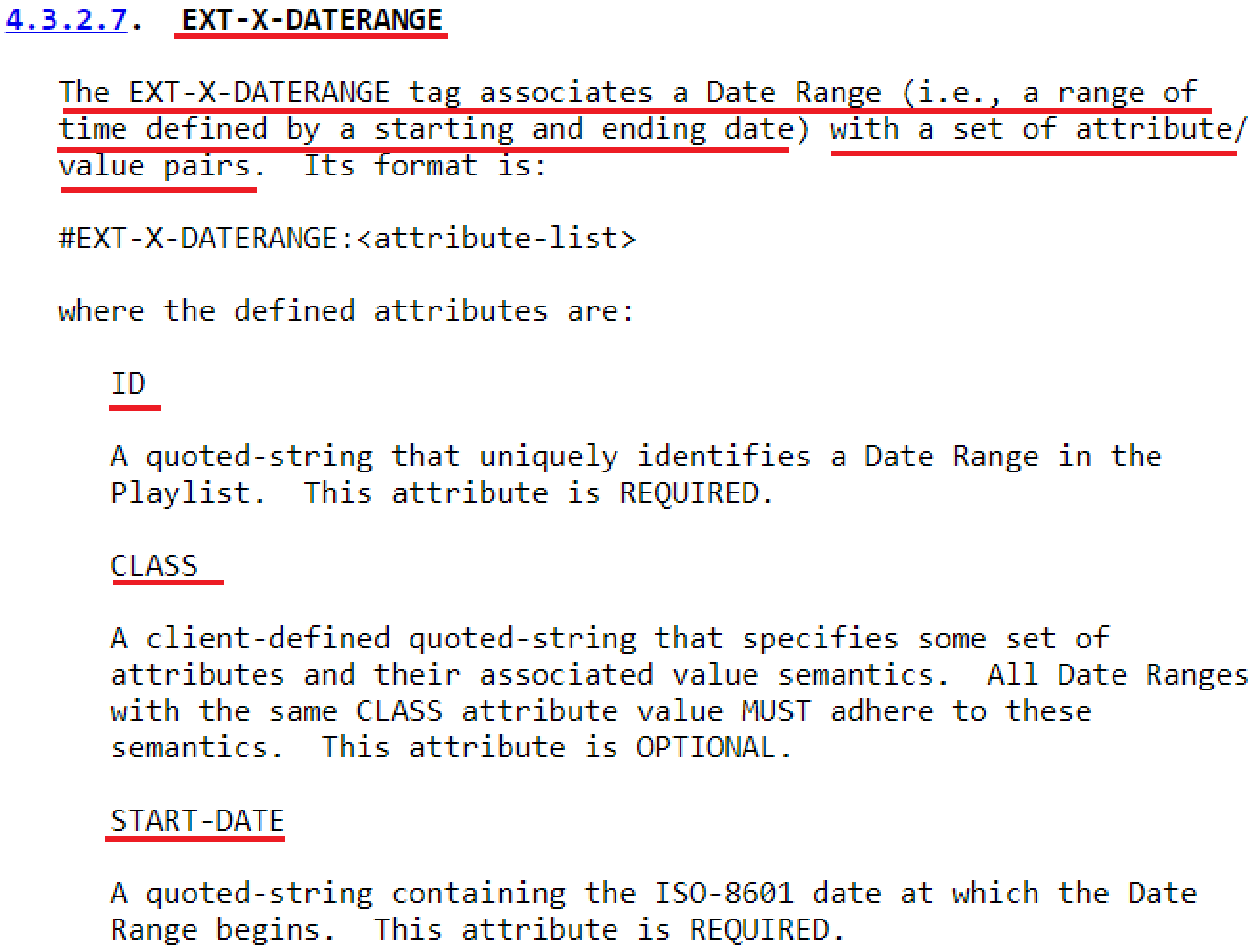
7,848,328	Imagine Learning ("Accused Instrumentality")
	 3.2. MPEG-2 Transport Streams MPEG-2 Transport Streams are specified by [ISO_13818]. The Media Initialization Section of an MPEG-2 Transport Stream Segment is a Program Association Table (PAT) followed by a Program Map Table (PMT). Transport Stream Segments MUST contain a single MPEG-2 Program; playback of Multi-Program Transport Streams is not defined. Each Transport Stream Segment MUST contain a PAT and a PMT, or have an EXT-X-MAP tag (Section 4.3.2.5) applied to it. The first two Transport Stream packets in a Segment without an EXT-X-MAP tag SHOULD be a PAT and a PMT. https://datatracker.ietf.org/doc/html/rfc8216

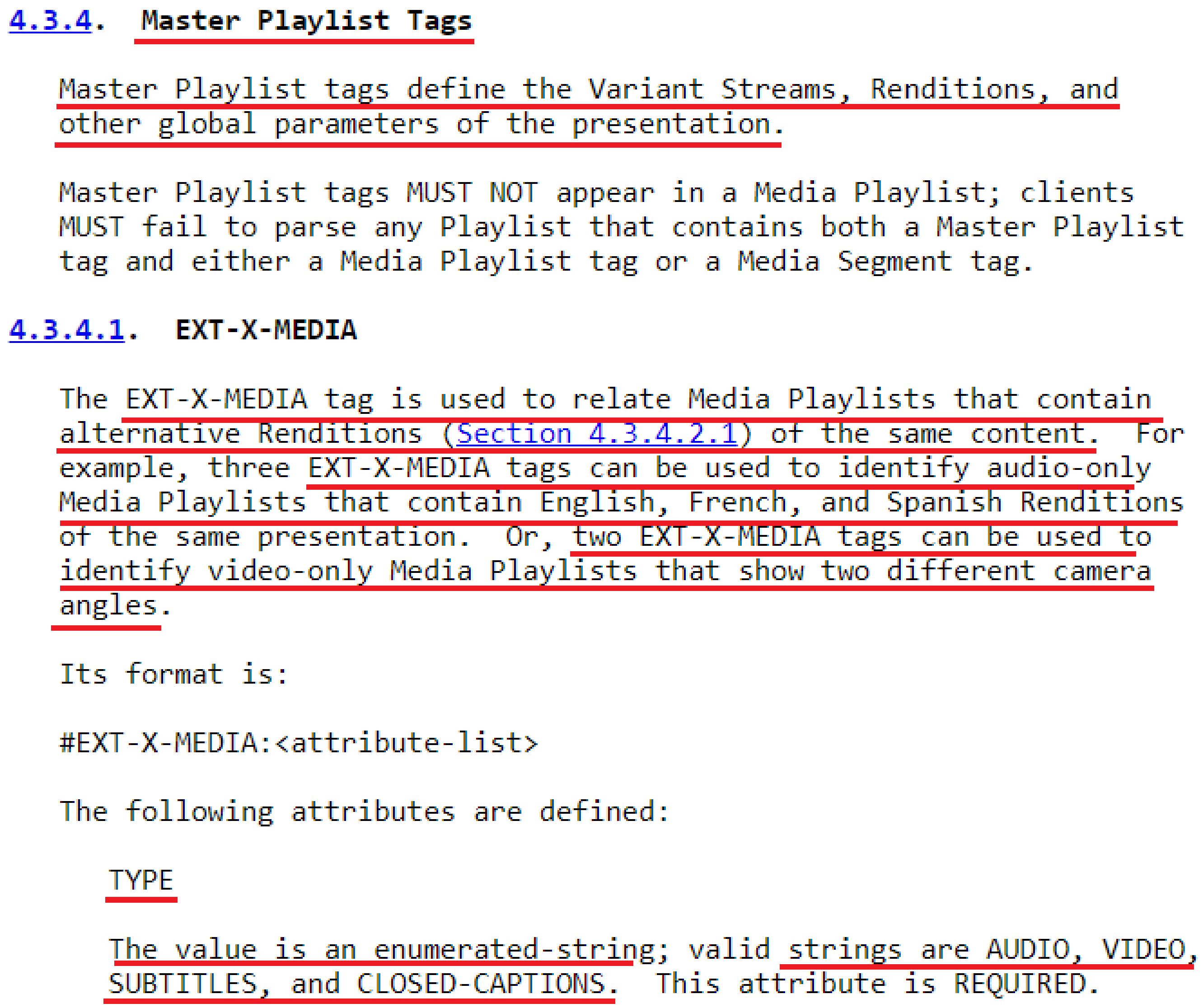
7,848,328	Imagine Learning ("Accused Instrumentality")
	 3.4. Packed Audio A Packed Audio Segment contains encoded audio samples and ID3 tags that are simply packed together with minimal framing and no per-sample timestamps. Supported Packed Audio formats are Advanced Audio Coding (AAC) with Audio Data Transport Stream (ADTS) framing [ISO_13818_7], MP3 [ISO_13818_3], AC-3 [AC_3], and Enhanced AC-3 [AC_3]. A Packed Audio Segment has no Media Initialization Section. Each Packed Audio Segment MUST signal the timestamp of its first sample with an ID3 Private frame (PRIV) tag [ID3] at the beginning of the segment. The ID3 PRIV owner identifier MUST be "com.apple.streaming.transportStreamTimestamp". The ID3 payload MUST be a 33-bit MPEG-2 Program Elementary Stream timestamp expressed as a big-endian eight-octet number, with the upper 31 bits set to zero. Clients SHOULD NOT play Packed Audio Segments without this ID3 tag. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 3.5. WebVTT A WebVTT Segment is a section of a WebVTT [WebVTT] file. WebVTT Segments carry subtitles. The Media Initialization Section of a WebVTT Segment is the WebVTT header. Each WebVTT Segment MUST contain all subtitle cues that are intended to be displayed during the period indicated by the segment EXTINF duration. The start time offset and end time offset of each cue MUST indicate the total display time for that cue, even if part of the cue time range is outside the Segment period. A WebVTT Segment MAY contain no cues; this indicates that no subtitles are to be displayed during that period. https://datatracker.ietf.org/doc/html/rfc8216

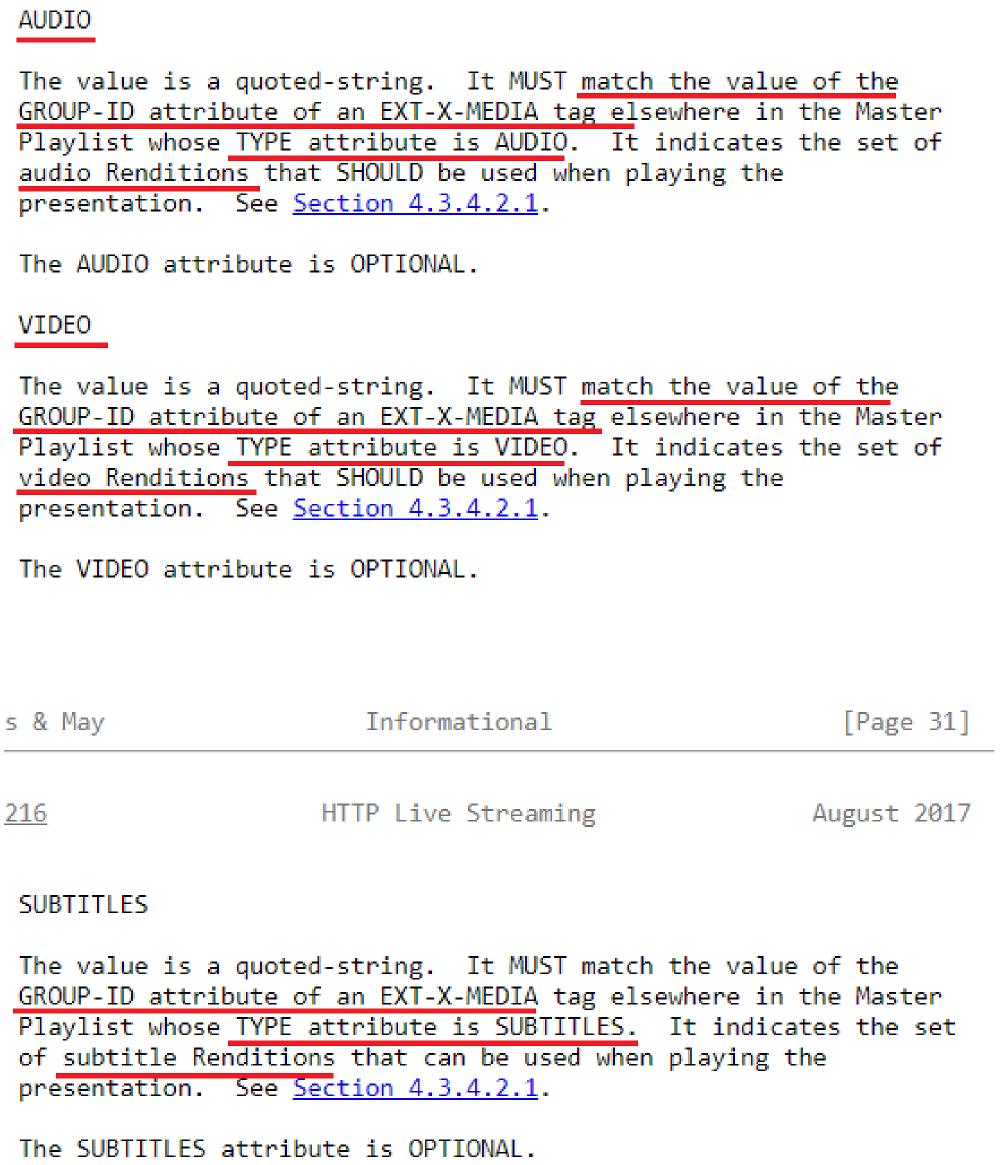
7,848,328	Imagine Learning ("Accused Instrumentality")
	 In order to synchronize timestamps between audio/video and subtitles, an X-TIMESTAMP-MAP metadata header SHOULD be added to each WebVTT header. This header maps WebVTT cue timestamps to MPEG-2 (PES) timestamps in other Renditions of the Variant Stream. Its format is: X-TIMESTAMP-MAP=LOCAL:<cue time>,MPEGTS:<MPEG-2 time> e.g., X-TIMESTAMP-MAP=LOCAL:00:00:00.000,MPEGTS:900000 The cue timestamp in the LOCAL attribute MAY fall outside the range of time covered by the segment. If a WebVTT segment does not have the X-TIMESTAMP-MAP, the client MUST assume that the WebVTT cue time of 0 maps to an MPEG-2 timestamp of 0. When synchronizing WebVTT with PES timestamps, clients SHOULD account for cases where the 33-bit PES timestamps have wrapped and the WebVTT cue times have not. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning ("Accused Instrumentality")
	 4.3.2. Media Segment Tags Each Media Segment is specified by a series of Media Segment tags followed by a URI. Some Media Segment tags apply to just the next segment; others apply to all subsequent segments until another instance of the same tag. A Media Segment tag MUST NOT appear in a Master Playlist. Clients MUST fail to parse Playlists that contain both Media Segment tags and Master Playlist tags (Section 4.3.4). 4.3.2.1. EXTINF The EXTINF tag specifies the duration of a Media Segment. It applies only to the next Media Segment. This tag is REQUIRED for each Media Segment. Its format is: #EXTINF:<duration>,[<title>] https://datatracker.ietf.org/doc/html/rfc8216

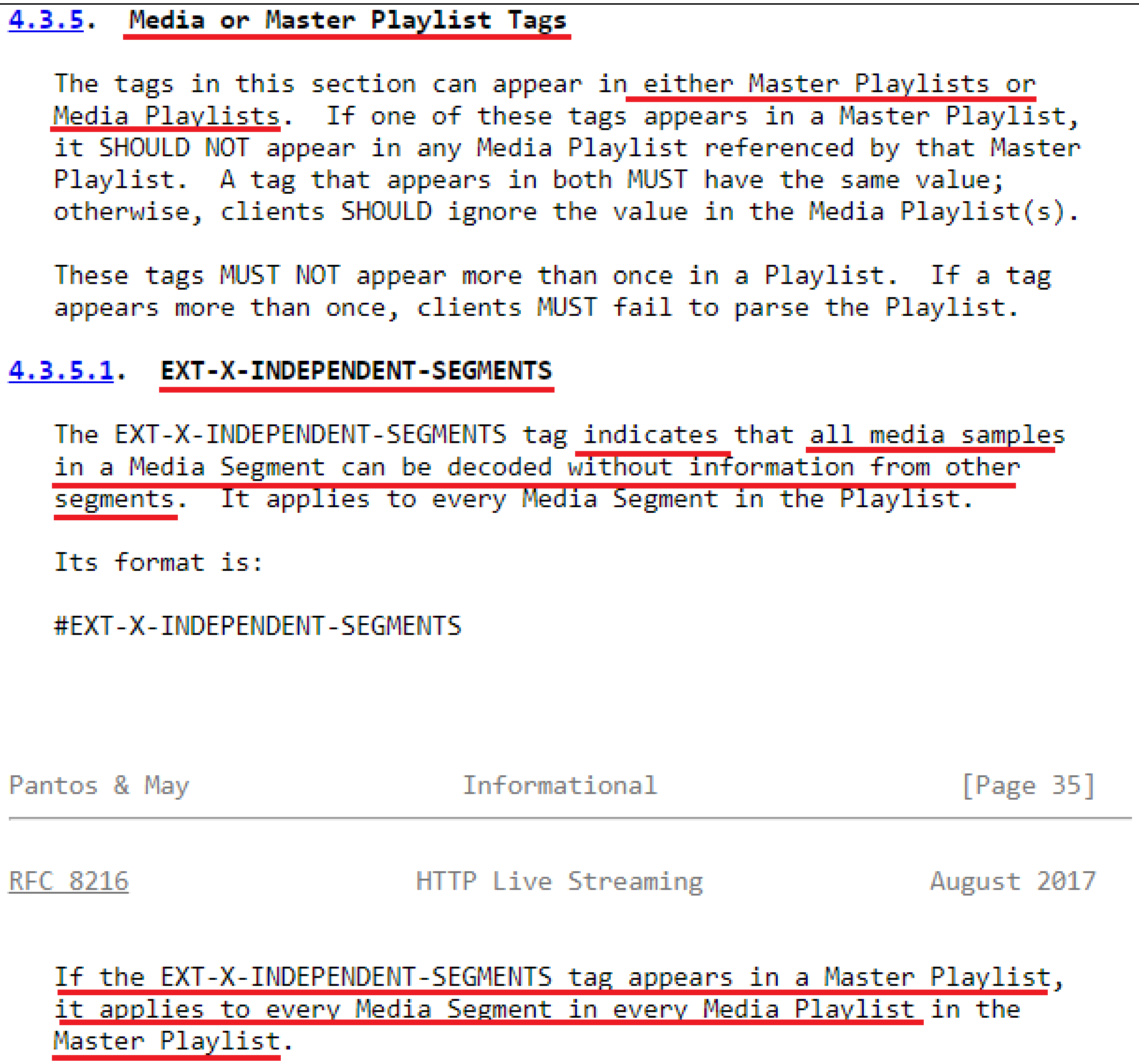
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 4.3.2.7. EXT-X-DATERANGE The EXT-X-DATERANGE tag associates a Date Range (i.e., a range of time defined by a starting and ending date) with a set of attribute/value pairs. Its format is: #EXT-X-DATERANGE:<attribute-list> where the defined attributes are: ID A quoted-string that uniquely identifies a Date Range in the Playlist. This attribute is REQUIRED. CLASS A client-defined quoted-string that specifies some set of attributes and their associated value semantics. All Date Ranges with the same CLASS attribute value MUST adhere to these semantics. This attribute is OPTIONAL. START-DATE A quoted-string containing the ISO-8601 date at which the Date Range begins. This attribute is REQUIRED. https://datatracker.ietf.org/doc/html/rfc8216

	 4.3.4. **Master Playlist Tags** Master Playlist tags define the Variant Streams, Renditions, and other global parameters of the presentation. Master Playlist tags MUST NOT appear in a Media Playlist; clients MUST fail to parse any Playlist that contains both a Master Playlist tag and either a Media Playlist tag or a Media Segment tag. 4.3.4.1. **EXT-X-MEDIA** The EXT-X-MEDIA tag is used to relate Media Playlists that contain alternative Renditions (Section 4.3.4.2.1) of the same content. For example, three EXT-X-MEDIA tags can be used to identify audio-only Media Playlists that contain English, French, and Spanish Renditions of the same presentation. Or, two EXT-X-MEDIA tags can be used to identify video-only Media Playlists that show two different camera angles. Its format is: #EXT-X-MEDIA:<attribute-list> The following attributes are defined: TYPE The value is an enumerated-string; valid strings are AUDIO, VIDEO, SUBTITLES, and CLOSED-CAPTIONS. This attribute is REQUIRED. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	**Imagine Learning ("Accused Instrumentality")**

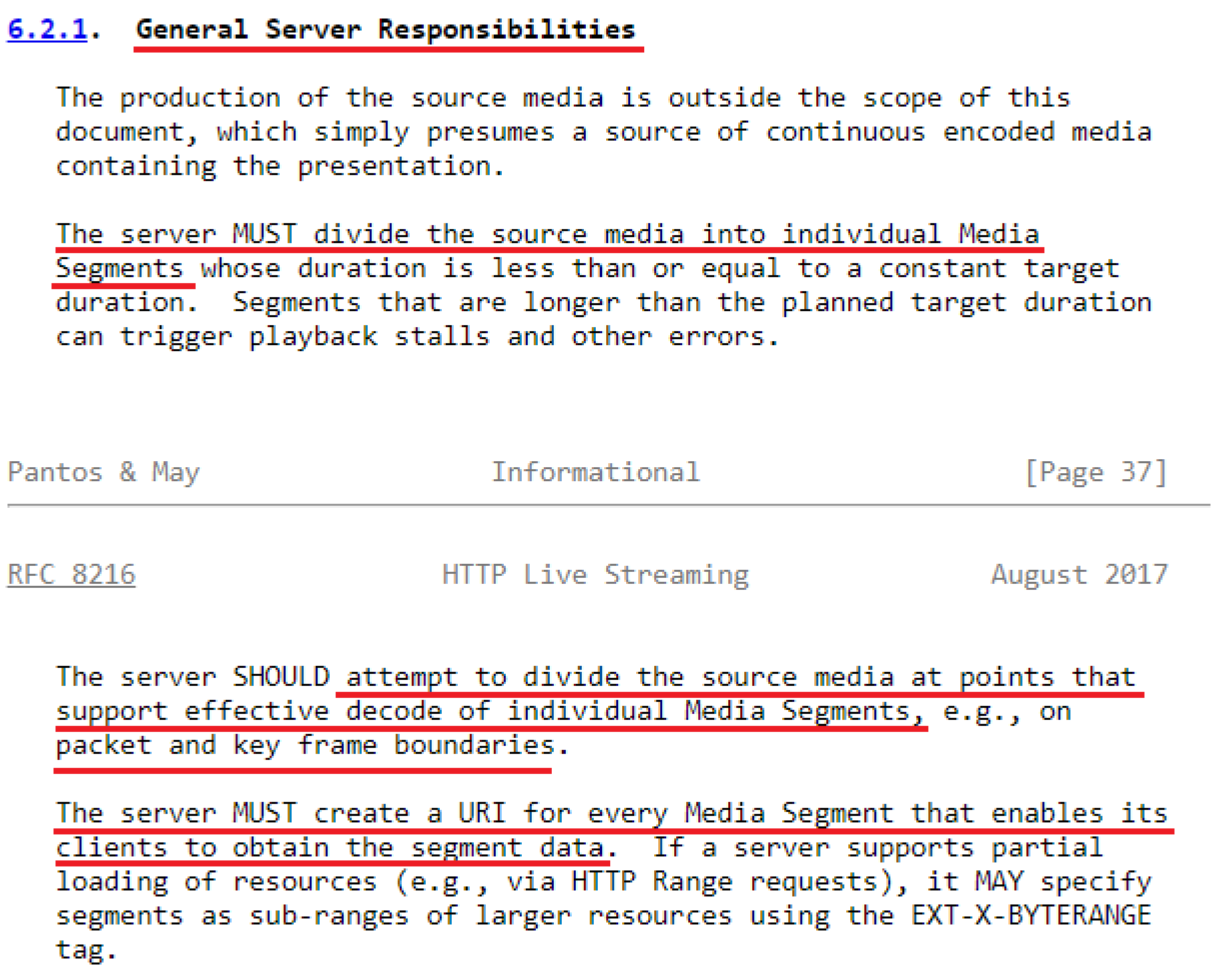
	 AUDIO The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is AUDIO. It indicates the set of audio Renditions that SHOULD be used when playing the presentation. See Section 4.3.4.2.1. The AUDIO attribute is OPTIONAL. VIDEO The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is VIDEO. It indicates the set of video Renditions that SHOULD be used when playing the presentation. See Section 4.3.4.2.1. The VIDEO attribute is OPTIONAL. s & May Informational [Page 31] 216 HTTP Live Streaming August 2017 SUBTITLES The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is SUBTITLES. It indicates the set of subtitle Renditions that can be used when playing the presentation. See Section 4.3.4.2.1. The SUBTITLES attribute is OPTIONAL.

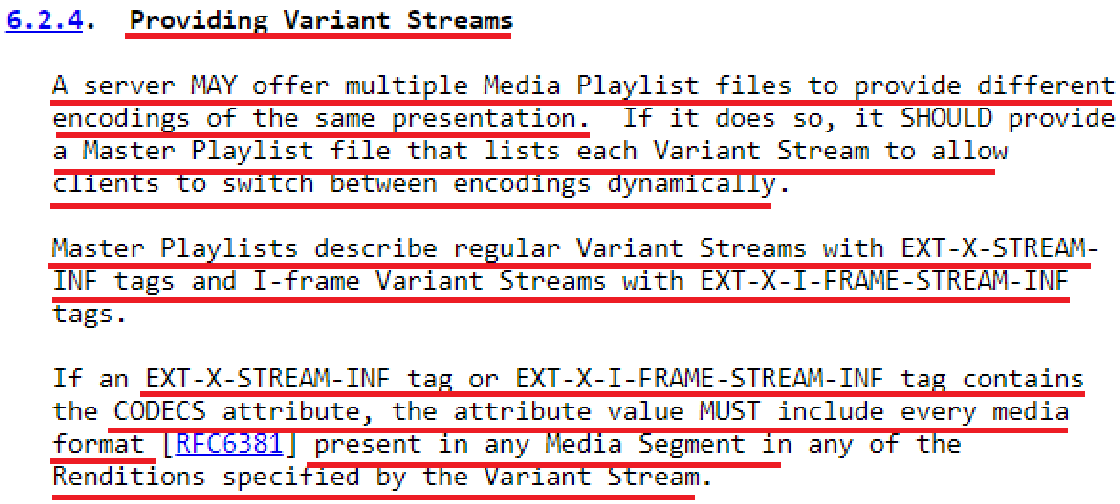
7,848,328	Imagine Learning ("Accused Instrumentality")
	https://datatracker.ietf.org/doc/html/rfc8216

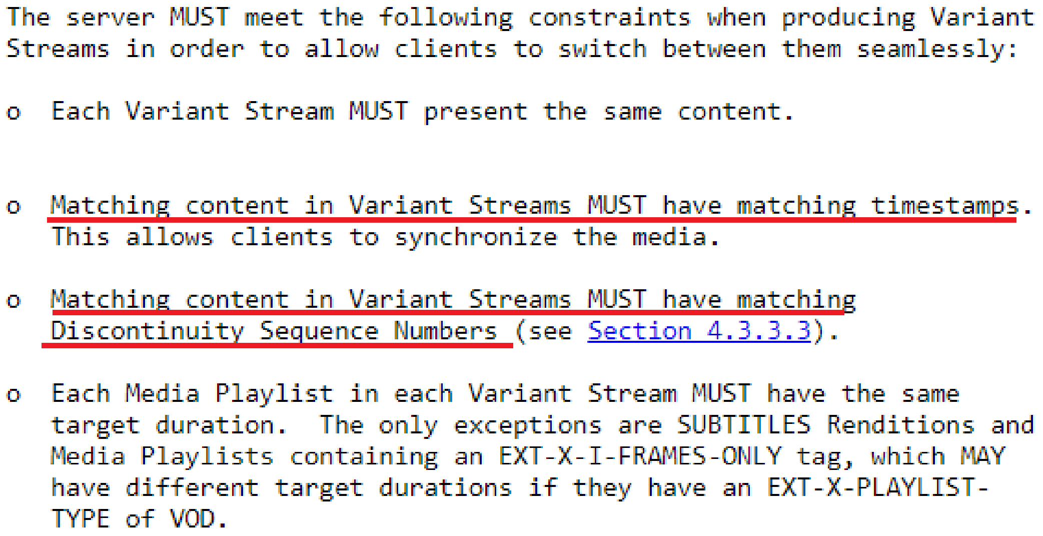
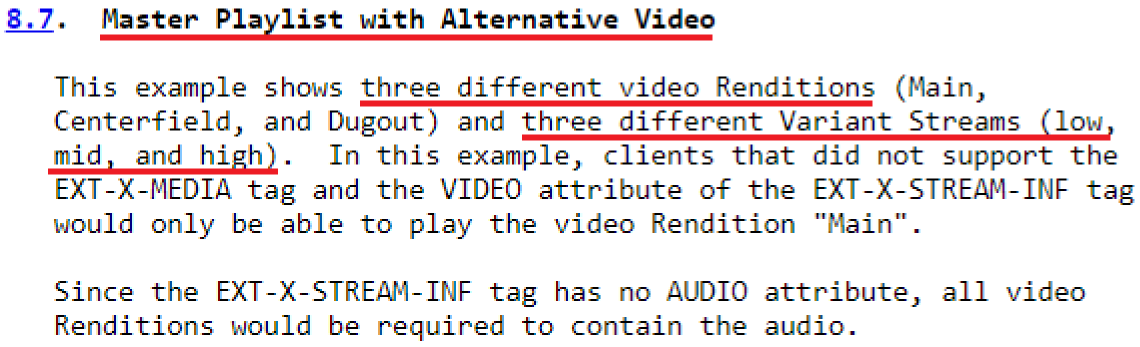


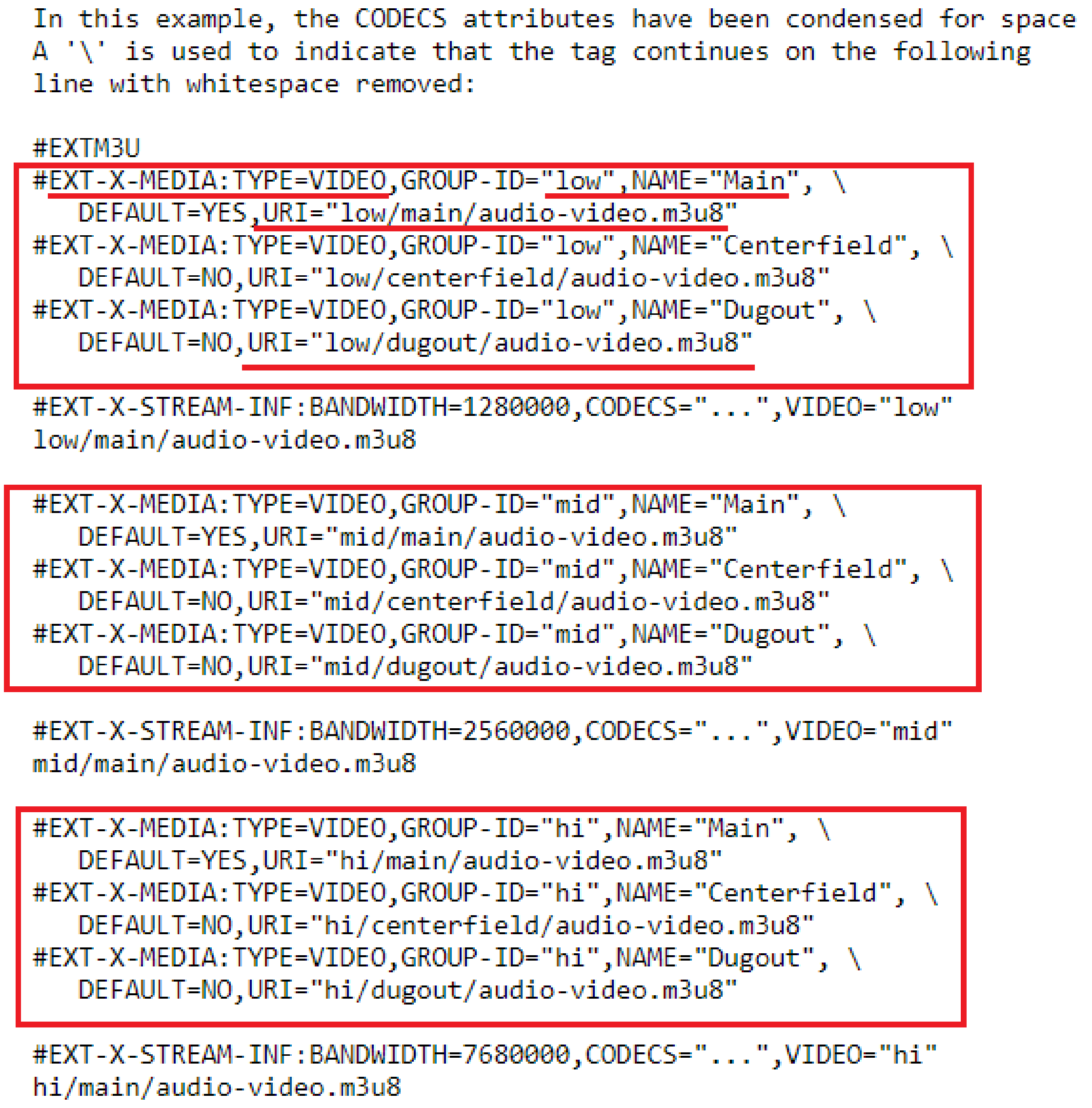
```
4.3.5.  Media or Master Playlist Tags

   The tags in this section can appear in either Master Playlists or
   Media Playlists.  If one of these tags appears in a Master Playlist,
   it SHOULD NOT appear in any Media Playlist referenced by that Master
   Playlist.  A tag that appears in both MUST have the same value;
   otherwise, clients SHOULD ignore the value in the Media Playlist(s).

   These tags MUST NOT appear more than once in a Playlist.  If a tag
   appears more than once, clients MUST fail to parse the Playlist.

4.3.5.1.  EXT-X-INDEPENDENT-SEGMENTS

   The EXT-X-INDEPENDENT-SEGMENTS tag indicates that all media samples
   in a Media Segment can be decoded without information from other
   segments.  It applies to every Media Segment in the Playlist.

   Its format is:

   #EXT-X-INDEPENDENT-SEGMENTS



Pantos & May                 Informational                     [Page 35]

RFC 8216                  HTTP Live Streaming                August 2017


   If the EXT-X-INDEPENDENT-SEGMENTS tag appears in a Master Playlist,
   it applies to every Media Segment in every Media Playlist in the
   Master Playlist.
```

https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning ("Accused Instrumentality")
	 **6.2.1. General Server Responsibilities** The production of the source media is outside the scope of this document, which simply presumes a source of continuous encoded media containing the presentation. The server MUST divide the source media into individual Media Segments whose duration is less than or equal to a constant target duration. Segments that are longer than the planned target duration can trigger playback stalls and other errors. Pantos & May Informational [Page 37] RFC 8216 HTTP Live Streaming August 2017 The server SHOULD attempt to divide the source media at points that support effective decode of individual Media Segments, e.g., on packet and key frame boundaries. The server MUST create a URI for every Media Segment that enables its clients to obtain the segment data. If a server supports partial loading of resources (e.g., via HTTP Range requests), it MAY specify segments as sub-ranges of larger resources using the EXT-X-BYTERANGE tag. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning ("Accused Instrumentality")
	 6.2.4. Providing Variant Streams A server MAY offer multiple Media Playlist files to provide different encodings of the same presentation. If it does so, it SHOULD provide a Master Playlist file that lists each Variant Stream to allow clients to switch between encodings dynamically. Master Playlists describe regular Variant Streams with EXT-X-STREAM-INF tags and I-frame Variant Streams with EXT-X-I-FRAME-STREAM-INF tags. If an EXT-X-STREAM-INF tag or EXT-X-I-FRAME-STREAM-INF tag contains the CODECS attribute, the attribute value MUST include every media format [RFC6381] present in any Media Segment in any of the Renditions specified by the Variant Stream. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 The server MUST meet the following constraints when producing Variant Streams in order to allow clients to switch between them seamlessly: o Each Variant Stream MUST present the same content. o Matching content in Variant Streams MUST have matching timestamps. This allows clients to synchronize the media. o Matching content in Variant Streams MUST have matching Discontinuity Sequence Numbers (see Section 4.3.3.3). o Each Media Playlist in each Variant Stream MUST have the same target duration. The only exceptions are SUBTITLES Renditions and Media Playlists containing an EXT-X-I-FRAMES-ONLY tag, which MAY have different target durations if they have an EXT-X-PLAYLIST-TYPE of VOD. https://datatracker.ietf.org/doc/html/rfc8216  8.7. Master Playlist with Alternative Video This example shows three different video Renditions (Main, Centerfield, and Dugout) and three different Variant Streams (low, mid, and high). In this example, clients that did not support the EXT-X-MEDIA tag and the VIDEO attribute of the EXT-X-STREAM-INF tag would only be able to play the video Rendition "Main". Since the EXT-X-STREAM-INF tag has no AUDIO attribute, all video Renditions would be required to contain the audio. https://datatracker.ietf.org/doc/html/rfc8216

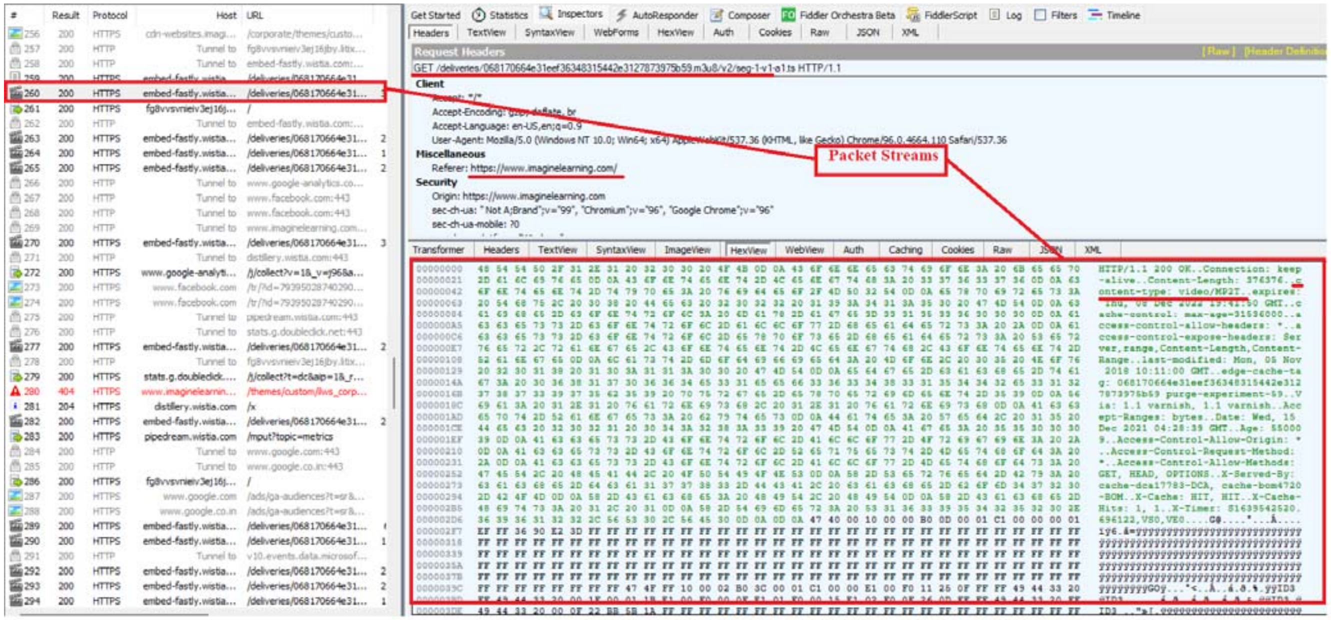


```
In this example, the CODECS attributes have been condensed for space
A '\' is used to indicate that the tag continues on the following
line with whitespace removed:

#EXTM3U
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="low",NAME="Main", \
   DEFAULT=YES,URI="low/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="low",NAME="Centerfield", \
   DEFAULT=NO,URI="low/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="low",NAME="Dugout", \
   DEFAULT=NO,URI="low/dugout/audio-video.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=1280000,CODECS="...",VIDEO="low"
low/main/audio-video.m3u8

#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="mid",NAME="Main", \
   DEFAULT=YES,URI="mid/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="mid",NAME="Centerfield", \
   DEFAULT=NO,URI="mid/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="mid",NAME="Dugout", \
   DEFAULT=NO,URI="mid/dugout/audio-video.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=2560000,CODECS="...",VIDEO="mid"
mid/main/audio-video.m3u8

#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="hi",NAME="Main", \
   DEFAULT=YES,URI="hi/main/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="hi",NAME="Centerfield", \
   DEFAULT=NO,URI="hi/centerfield/audio-video.m3u8"
#EXT-X-MEDIA:TYPE=VIDEO,GROUP-ID="hi",NAME="Dugout", \
   DEFAULT=NO,URI="hi/dugout/audio-video.m3u8"

#EXT-X-STREAM-INF:BANDWIDTH=7680000,CODECS="...",VIDEO="hi"
hi/main/audio-video.m3u8
```

https://datatracker.ietf.org/doc/html/rfc8216

NIMITZ TECHNOLOGIES LLC CLAIM CHARTS RE PAT. 7,848,328

Preliminary charts based on best available information

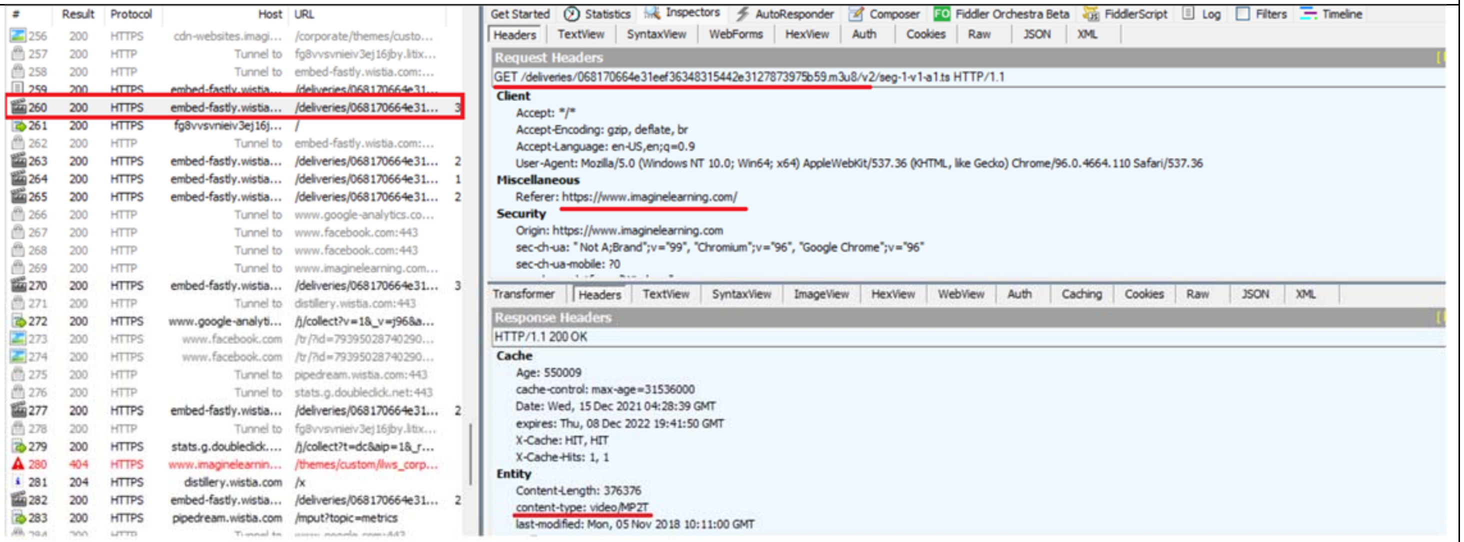
7,848,328	Imagine Learning ("Accused Instrumentality")
encapsulating each data stream of the plurality into a stream of packets according to a first communication protocol,	The accused standard discloses encapsulating each data stream (e.g., media streams such as audio, video, captions, etc.) of the plurality into a stream of packets (e.g., index file m3u8 data packets) according to a first communication protocol (e.g., Transmission control protocol). As shown below, For HLS, MPEG-2 transport stream is used to encapsulate the data stream (e.g., media streams such as audio, video, captions, etc.) using first communication protocol (e.g. TCP).  *Source: Packet capture by Fiddler tool*

```
Request Headers
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    Origin: https://www.imaginelearning.com
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
```

```
HTTP/1.1 200 OK..Connection: keep
-alive..Content-Length: 376376..c
ontent-type: video/MP2T..expires:
 Thu, 08 Dec 2022 15:41:50 GMT..c
ache-control: max-age=31536000..a
ccess-control-allow-headers: *..a
ccess-control-expose-headers: Ser
ver,range,Content-Length,Content-
Range..last-modified: Mon, 05 Nov
 2018 10:11:00 GMT..edge-cache-ta
g: 068170664e31eef36348315442e312
7873975b59 purge-experiment-59..V
ia: 1.1 varnish, 1.1 varnish..Acc
ept-Ranges: bytes..Date: Wed, 15 
Dec 2021 04:28:39 GMT..Age: 55000
9..Access-Control-Allow-Origin: *
..Access-Control-Request-Method: 
*..Access-Control-Allow-Methods: 
GET, HEAD, OPTIONS..X-Served-By: 
cache-dca17783-DCA, cache-bom4720
-BOM..X-Cache: HIT, HIT..X-Cache-
Hits: 1, 1..X-Timer: S1639542520.
696122,VS0,VE0....G@....*...Å....
```

Preliminary charts based on best available information

<table>
<tr><th>7,848,328</th><th>Imagine Learning (“Accused Instrumentality”)</th></tr>
<tr><td></td><td>

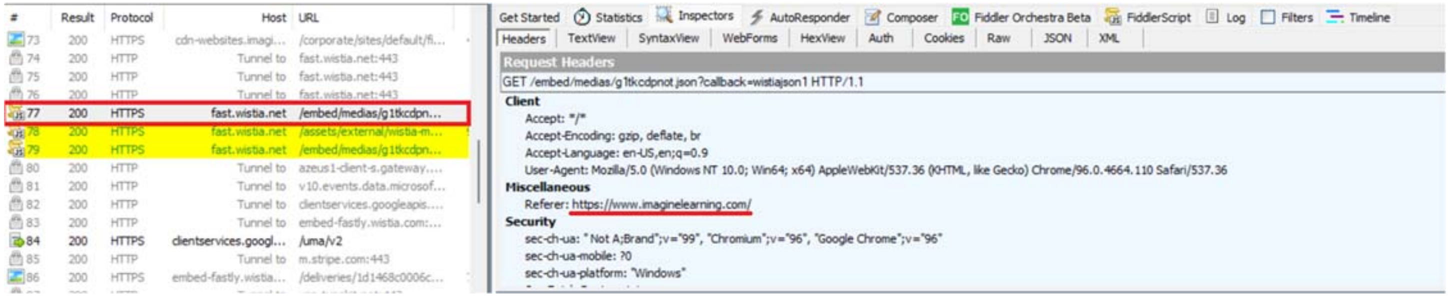


```
#    Result  Protocol  Host                    URL
256  200     HTTPS     cdn-websites.imagi...   /corporate/themes/custo...
257  200     HTTP      Tunnel to               fg8vvsvnieiv3ej16jby.litix...
258  200     HTTP      Tunnel to               embed-fastly.wistia.com:...
259  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...
260  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  3
261  200     HTTPS     fg8vvsvnieiv3ej16j...   /
262  200     HTTP      Tunnel to               embed-fastly.wistia.com:...
263  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  2
264  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  1
265  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  2
266  200     HTTP      Tunnel to               www.google-analytics.co...
267  200     HTTP      Tunnel to               www.facebook.com:443
268  200     HTTP      Tunnel to               www.facebook.com:443
269  200     HTTP      Tunnel to               www.imaginelearning.com...
270  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  3
271  200     HTTP      Tunnel to               distillery.wistia.com:443
272  200     HTTPS     www.google-analyti...   /j/collect?v=1&_v=j96&a...
273  200     HTTPS     www.facebook.com        /tr/?id=79395028740290...
274  200     HTTPS     www.facebook.com        /tr/?id=79395028740290...
275  200     HTTP      Tunnel to               pipedream.wistia.com:443
276  200     HTTP      Tunnel to               stats.g.doubleclick.net:443
277  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  2
278  200     HTTP      Tunnel to               fg8vvsvnieiv3ej16jby.litix...
279  200     HTTPS     stats.g.doubleclick....  /j/collect?t=dc&aip=1&_r...
280  404     HTTPS     www.imaginelearnin...   /themes/custom/ilws_corp...
281  204     HTTPS     distillery.wistia.com   /x
282  200     HTTPS     embed-fastly.wistia...  /deliveries/068170664e31...  2
283  200     HTTPS     pipedream.wistia.com    /mput?topic=metrics
```

```
Request Headers
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    Origin: https://www.imaginelearning.com
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
```

```
Response Headers
HTTP/1.1 200 OK
Cache
    Age: 550009
    cache-control: max-age=31536000
    Date: Wed, 15 Dec 2021 04:28:39 GMT
    expires: Thu, 08 Dec 2022 19:41:50 GMT
    X-Cache: HIT, HIT
    X-Cache-Hits: 1, 1
Entity
    Content-Length: 376376
    content-type: video/MP2T
    last-modified: Mon, 05 Nov 2018 10:11:00 GMT
```

Source: Packet capture by Fiddler tool

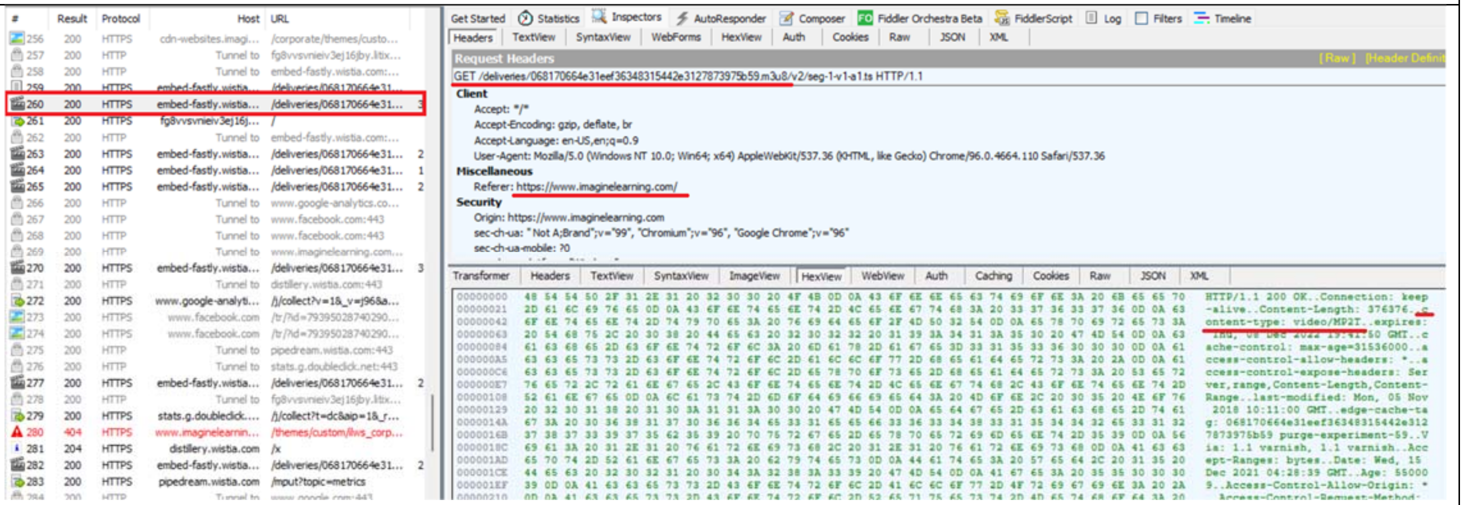


```
#   Result  Protocol  Host                    URL
73  200     HTTPS     cdn-websites.imagi...   /corporate/sites/default/fi...
74  200     HTTP      Tunnel to               fast.wistia.net:443
75  200     HTTP      Tunnel to               fast.wistia.net:443
76  200     HTTP      Tunnel to               fast.wistia.net:443
77  200     HTTPS     fast.wistia.net         /embed/medias/g1tkcdpn...
78  200     HTTPS     fast.wistia.net         /assets/external/wistia-m...
79  200     HTTPS     fast.wistia.net         /embed/medias/g1tkcdpn...
80  200     HTTP      Tunnel to               azeus1-client-s.gateway....
81  200     HTTP      Tunnel to               v10.events.data.microsof...
82  200     HTTP      Tunnel to               clientservices.googleapis....
83  200     HTTP      Tunnel to               embed-fastly.wistia.com:...
84  200     HTTPS     clientservices.googl...  /uma/v2
85  200     HTTP      Tunnel to               m.stripe.com:443
86  200     HTTPS     embed-fastly.wistia...  /deliveries/1d1468c0006c...
```

```
Request Headers
GET /embed/medias/g1tkcdpnot.json?callback=wistiajson1 HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
    sec-ch-ua-platform: "Windows"
```

Source: Packet capture by Fiddler tool

</td></tr>
</table>

7,848,328	Imagine Learning ("Accused Instrumentality")
	

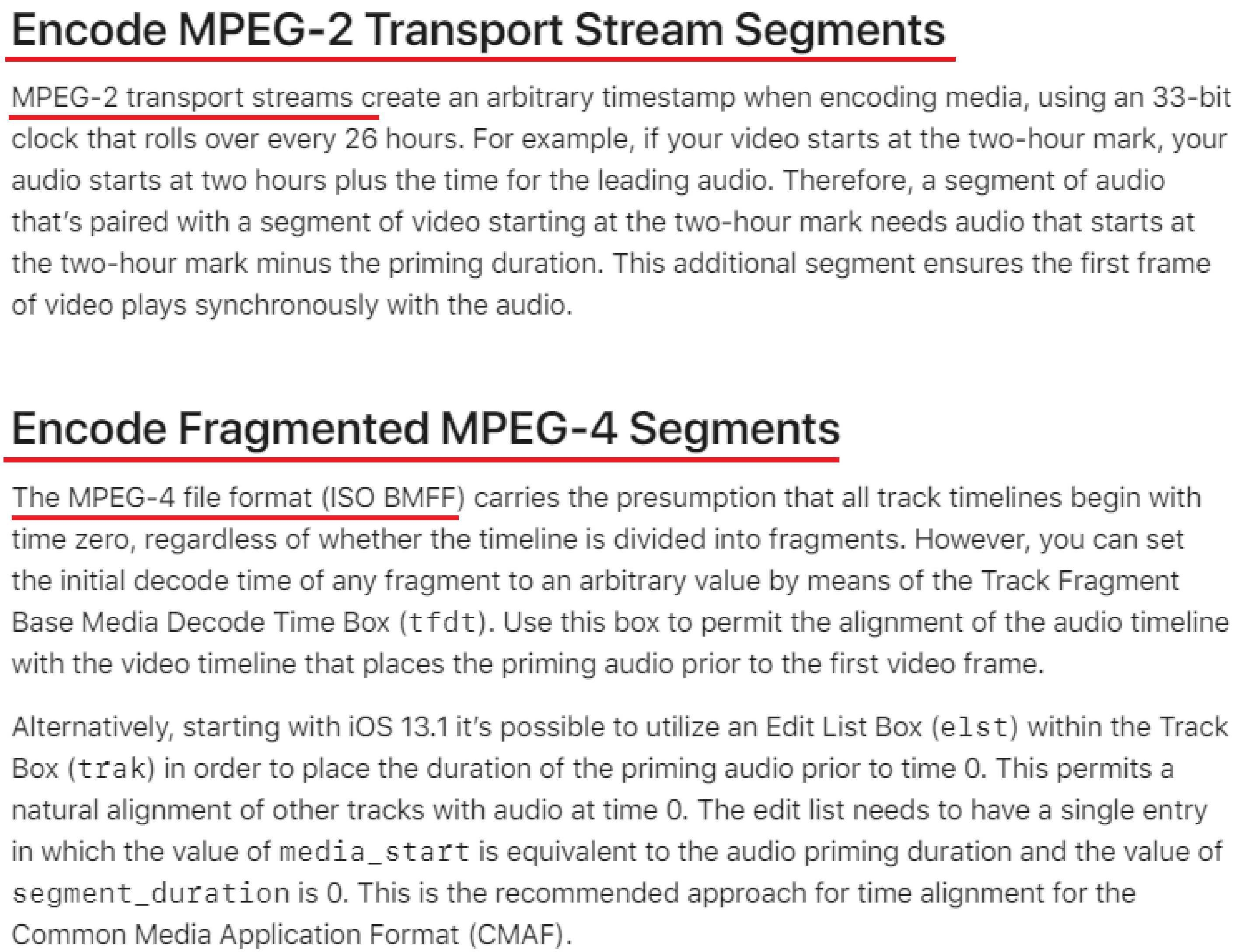
#	Result	Protocol	Host	URL	
256	200	HTTPS	cdn-websites.imagi...	/corporate/themes/custo...	
257	200	HTTP	Tunnel to	fg8vvsvnieiv3ej16jby.litix...	
258	200	HTTP	Tunnel to	embed-fastly.wistia.com:...	
259	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	
260	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	3
261	200	HTTPS	fg8vvsvnieiv3ej16j...	/	
262	200	HTTP	Tunnel to	embed-fastly.wistia.com:...	
263	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
264	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	1
265	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
266	200	HTTP	Tunnel to	www.google-analytics.co...	
267	200	HTTP	Tunnel to	www.facebook.com:443	
268	200	HTTP	Tunnel to	www.facebook.com:443	
269	200	HTTP	Tunnel to	www.imaginelearning.com...	
270	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	3
271	200	HTTP	Tunnel to	distillery.wistia.com:443	
272	200	HTTPS	www.google-analyti...	/j/collect?v=1&_v=j96&a...	
273	200	HTTPS	www.facebook.com	/tr/?id=79395028740290...	
274	200	HTTPS	www.facebook.com	/tr/?id=79395028740290...	
275	200	HTTP	Tunnel to	pipedream.wistia.com:443	
276	200	HTTP	Tunnel to	stats.g.doubleclick.net:443	
277	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
278	200	HTTP	Tunnel to	fg8vvsvnieiv3ej16jby.litix...	
279	200	HTTPS	stats.g.doubleclick....	/j/collect?t=dc&aip=1&_r...	
280	404	HTTPS	www.imaginelearnin...	/themes/custom/ilws_corp...	
281	204	HTTPS	distillery.wistia.com	/x	
282	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
283	200	HTTPS	pipedream.wistia.com	/mput?topic=metrics	
284	200	HTTP	Tunnel to	www.google.com:443	

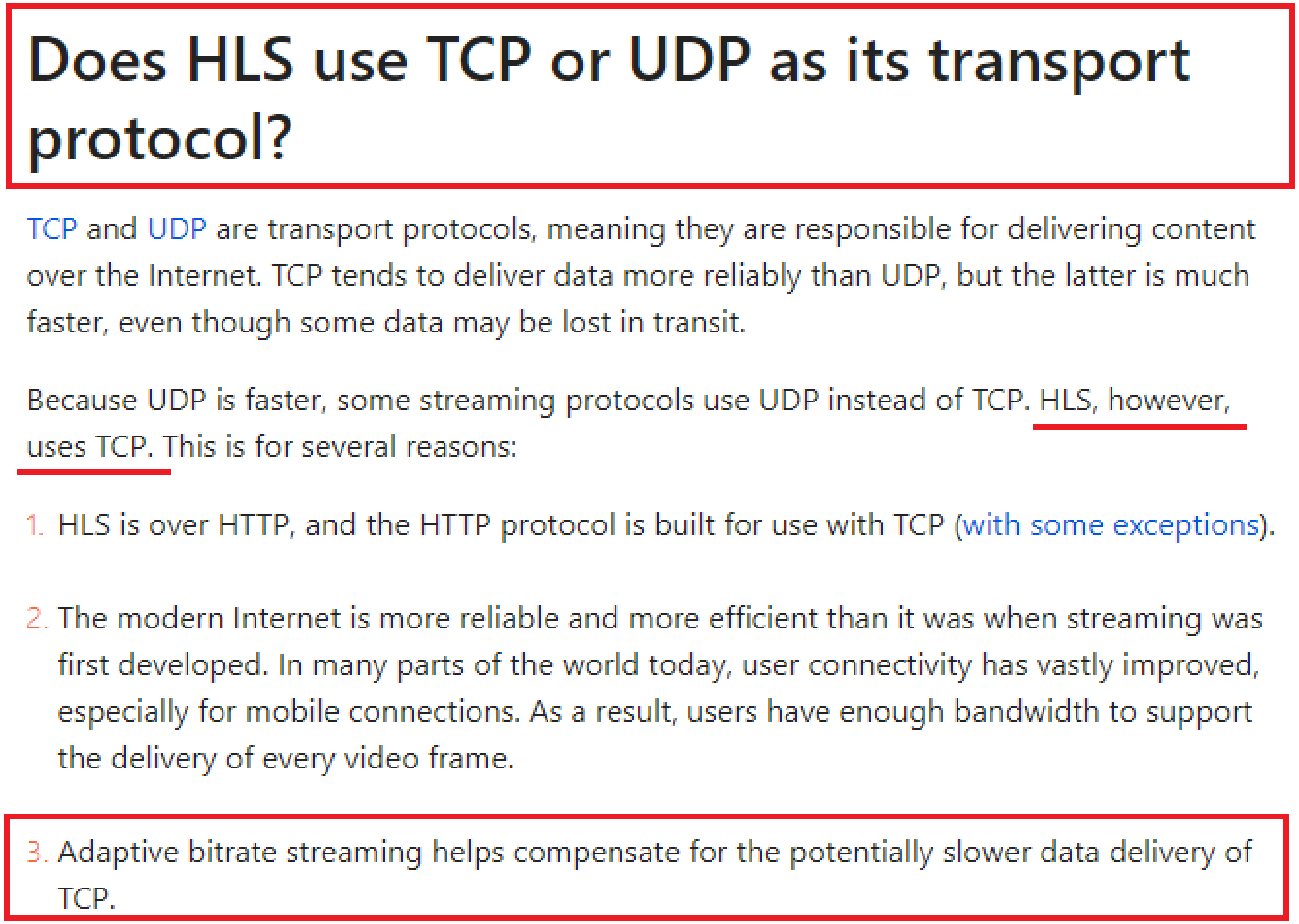
```
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    Origin: https://www.imaginelearning.com
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
```

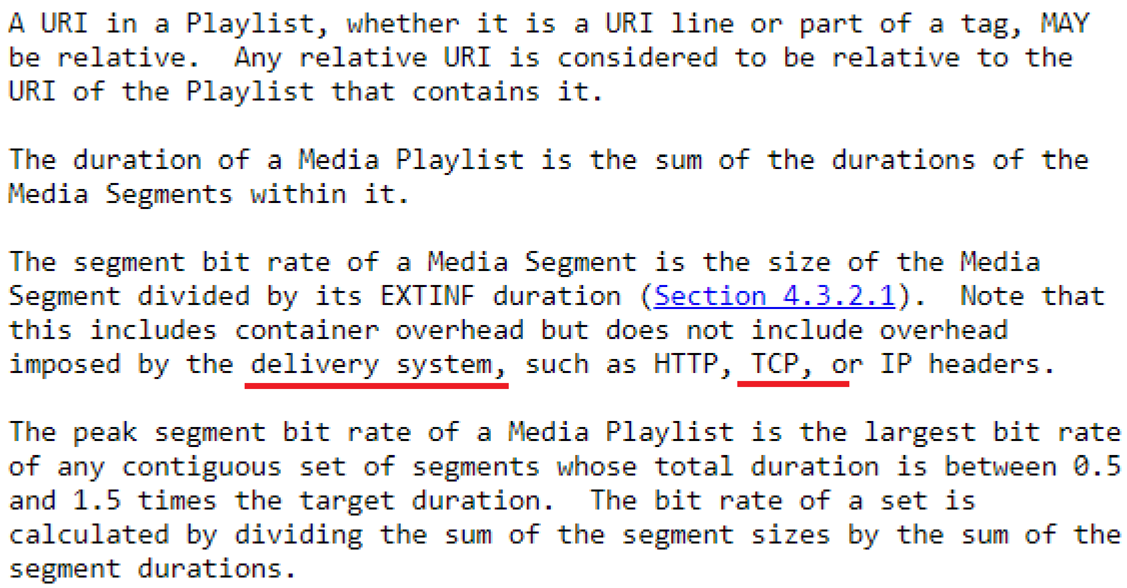
```
00000000  48 54 54 50 2F 31 2E 31 20 32 30 30 20 4F 4B 0D 0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 6B 65 65 70  HTTP/1.1 200 OK..Connection: keep
00000021  2D 61 6C 69 76 65 0D 0A 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 3A 20 33 37 36 33 37 36 0D 0A 63  -alive..Content-Length: 376376..c
00000042  6F 6E 74 65 6E 74 2D 74 79 70 65 3A 20 76 69 64 65 6F 2F 4D 50 32 54 0D 0A 65 78 70 69 72 65 73 3A  ontent-type: video/MP2T..expires:
00000063  20 54 68 75 2C 20 30 38 20 44 65 63 20 32 30 32 32 20 31 39 3A 34 31 3A 35 30 20 47 4D 54 0D 0A 63   Thu, 08 Dec 2022 19:41:50 GMT..c
00000084  61 63 68 65 2D 63 6F 6E 74 72 6F 6C 3A 20 6D 61 78 2D 61 67 65 3D 33 31 35 33 36 30 30 30 0D 0A 61  ache-control: max-age=31536000..a
000000A5  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 61 6C 6C 6F 77 2D 68 65 61 64 65 72 73 3A 20 2A 0D 0A 61  ccess-control-allow-headers: *..a
000000C6  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 65 78 70 6F 73 65 2D 68 65 61 64 65 72 73 3A 20 53 65 72  ccess-control-expose-headers: Ser
000000E7  76 65 72 2C 72 61 6E 67 65 2C 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 2C 43 6F 6E 74 65 6E 74 2D  ver,range,Content-Length,Content-
00000108  52 61 6E 67 65 0D 0A 6C 61 73 74 2D 6D 6F 64 69 66 69 65 64 3A 20 4D 6F 6E 2C 20 30 35 20 4E 6F 76  Range..last-modified: Mon, 05 Nov
00000129  20 32 30 31 38 20 31 30 3A 31 31 3A 30 30 20 47 4D 54 0D 0A 65 64 67 65 2D 63 61 63 68 65 2D 74 61   2018 10:11:00 GMT..edge-cache-ta
0000014A  67 3A 20 30 36 38 31 37 30 36 36 34 65 33 31 65 65 66 33 36 33 34 38 33 31 35 34 34 32 65 33 31 32  g: 068170664e31eef36348315442e312
0000016B  37 38 37 33 39 37 35 62 35 39 20 70 75 72 67 65 2D 65 78 70 65 72 69 6D 65 6E 74 2D 35 39 0D 0A 56  7873975b59 purge-experiment-59..V
0000018C  69 61 3A 20 31 2E 31 20 76 61 72 6E 69 73 68 2C 20 31 2E 31 20 76 61 72 6E 69 73 68 0D 0A 41 63 63  ia: 1.1 varnish, 1.1 varnish..Acc
000001AD  65 70 74 2D 52 61 6E 67 65 73 3A 20 62 79 74 65 73 0D 0A 44 61 74 65 3A 20 57 65 64 2C 20 31 35 20  ept-Ranges: bytes..Date: Wed, 15 
000001CE  44 65 63 20 32 30 32 31 20 30 34 3A 32 38 3A 33 39 20 47 4D 54 0D 0A 41 67 65 3A 20 35 35 30 30 30  Dec 2021 04:28:39 GMT..Age: 55000
000001EF  39 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 41 6C 6C 6F 77 2D 4F 72 69 67 69 6E 3A 20 2A  9..Access-Control-Allow-Origin: *
00000210  0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 52 65 71 75 65 73 74 2D 4D 65 74 68 6F 64 3A 20  ..Access-Control-Request-Method: 
```

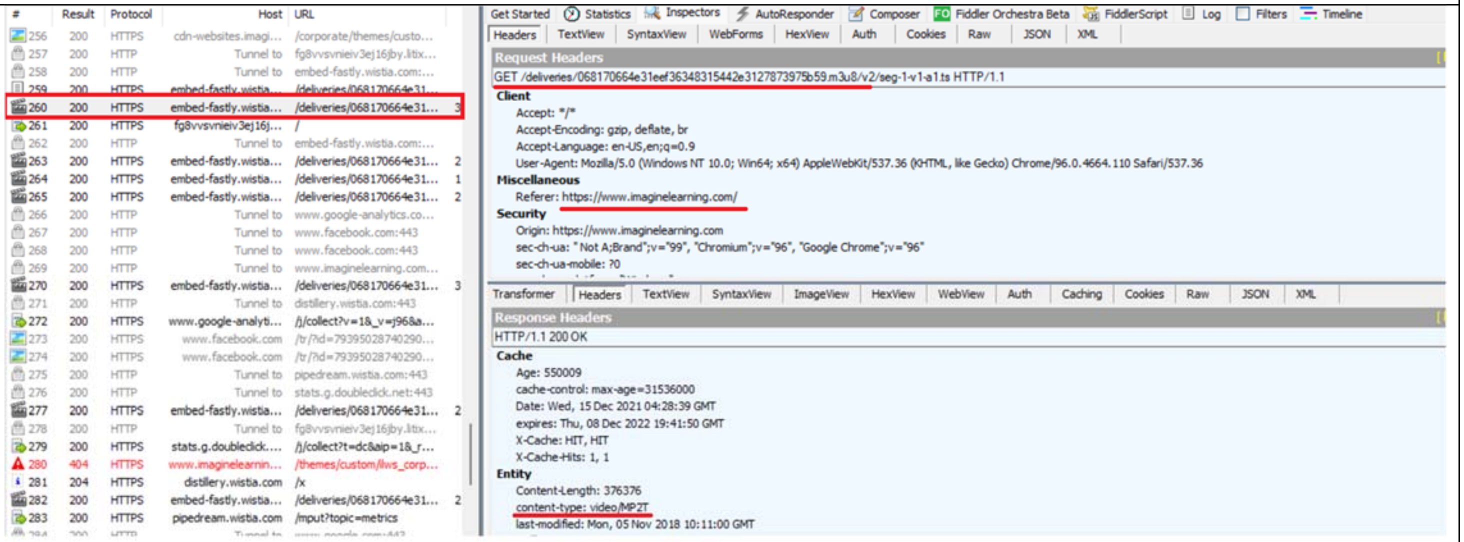
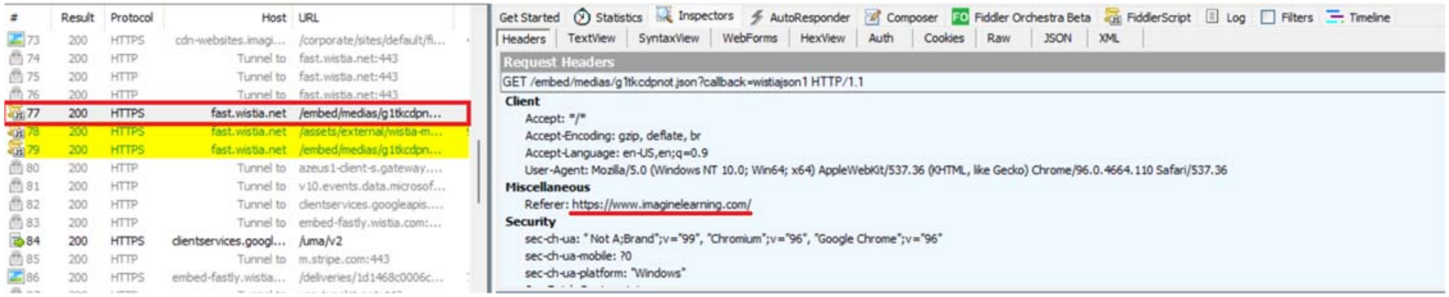
Source: Packet capture by Fiddler tool

Preliminary charts based on best available information

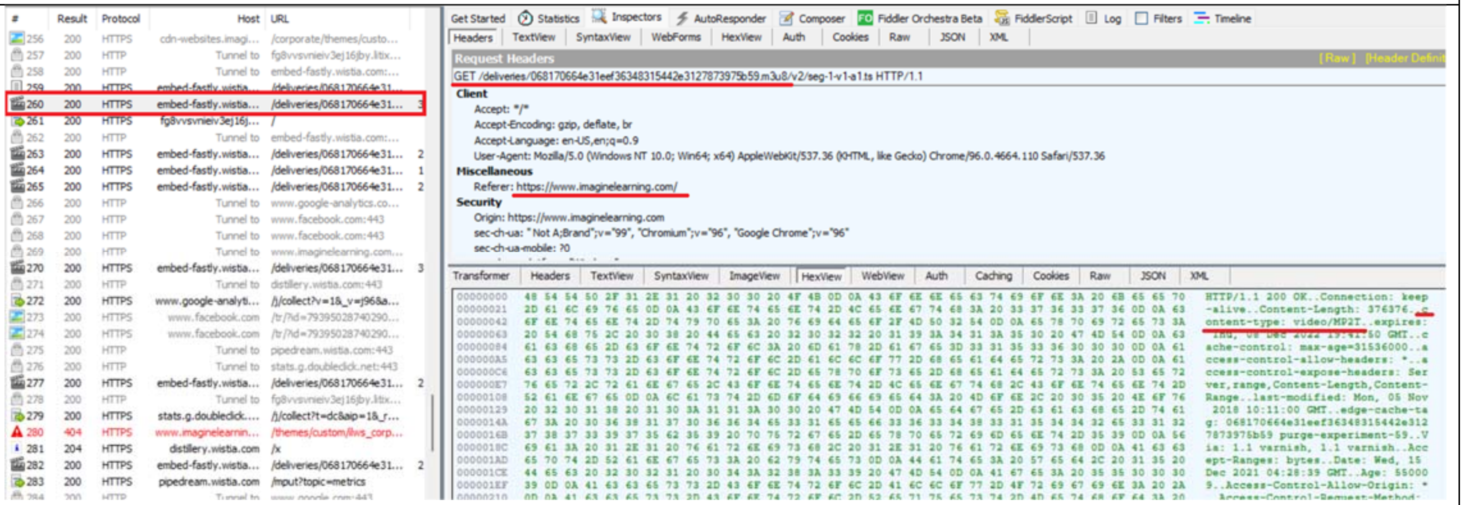
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 **Encode MPEG-2 Transport Stream Segments** MPEG-2 transport streams create an arbitrary timestamp when encoding media, using an 33-bit clock that rolls over every 26 hours. For example, if your video starts at the two-hour mark, your audio starts at two hours plus the time for the leading audio. Therefore, a segment of audio that's paired with a segment of video starting at the two-hour mark needs audio that starts at the two-hour mark minus the priming duration. This additional segment ensures the first frame of video plays synchronously with the audio. **Encode Fragmented MPEG-4 Segments** The MPEG-4 file format (ISO BMFF) carries the presumption that all track timelines begin with time zero, regardless of whether the timeline is divided into fragments. However, you can set the initial decode time of any fragment to an arbitrary value by means of the Track Fragment Base Media Decode Time Box (`tfdt`). Use this box to permit the alignment of the audio timeline with the video timeline that places the priming audio prior to the first video frame. Alternatively, starting with iOS 13.1 it's possible to utilize an Edit List Box (`elst`) within the Track Box (`trak`) in order to place the duration of the priming audio prior to time 0. This permits a natural alignment of other tracks with audio at time 0. The edit list needs to have a single entry in which the value of `media_start` is equivalent to the audio priming duration and the value of `segment_duration` is 0. This is the recommended approach for time alignment for the Common Media Application Format (CMAF).

7,848,328	Imagine Learning (“Accused Instrumentality”)
	https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming  **Does HLS use TCP or UDP as its transport protocol?** TCP and UDP are transport protocols, meaning they are responsible for delivering content over the Internet. TCP tends to deliver data more reliably than UDP, but the latter is much faster, even though some data may be lost in transit. Because UDP is faster, some streaming protocols use UDP instead of TCP. HLS, however, uses TCP. This is for several reasons: 1. HLS is over HTTP, and the HTTP protocol is built for use with TCP (with some exceptions). 2. The modern Internet is more reliable and more efficient than it was when streaming was first developed. In many parts of the world today, user connectivity has vastly improved, especially for mobile connections. As a result, users have enough bandwidth to support the delivery of every video frame. 3. Adaptive bitrate streaming helps compensate for the potentially slower data delivery of TCP. https://www.cloudflare.com/learning/video/what-is-http-live-streaming/

7,848,328	Imagine Learning ("Accused Instrumentality")
	 A URI in a Playlist, whether it is a URI line or part of a tag, MAY be relative. Any relative URI is considered to be relative to the URI of the Playlist that contains it. The duration of a Media Playlist is the sum of the durations of the Media Segments within it. The segment bit rate of a Media Segment is the size of the Media Segment divided by its EXTINF duration (Section 4.3.2.1). Note that this includes container overhead but does not include overhead imposed by the delivery system, such as HTTP, TCP, or IP headers. The peak segment bit rate of a Media Playlist is the largest bit rate of any contiguous set of segments whose total duration is between 0.5 and 1.5 times the target duration. The bit rate of a set is calculated by dividing the sum of the segment sizes by the sum of the segment durations. https://datatracker.ietf.org/doc/html/rfc8216#section-1
wherein, as to each of the packet streams, the packets have a value in a common field identifying the component mapped to the data	The accused standard discloses wherein, as to each of the packet streams (e.g., m3u8 data packet stream), the packets have a value (e.g., audio/video type, group id, etc.) in a common field identifying the component mapped to the data stream (e.g., media streams such as audio, video, captions, etc.) encapsulated by the packet stream (e.g., m3u8 data packet stream). As shown below, the common field shows "type: video"

7,848,328	Imagine Learning ("Accused Instrumentality")
stream encapsulated by the packet stream;	 # Result Protocol Host URL 256 200 HTTPS cdn-websites.imagi... /corporate/themes/custo... 257 200 HTTP Tunnel to fg8vvsvnieiv3ej16jby.litix... 258 200 HTTP Tunnel to embed-fastly.wistia.com:... 259 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 260 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 3 261 200 HTTPS fg8vvsvnieiv3ej16j... / 262 200 HTTP Tunnel to embed-fastly.wistia.com:... 263 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 2 264 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 1 265 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 2 266 200 HTTP Tunnel to www.google-analytics.co... 267 200 HTTP Tunnel to www.facebook.com:443 268 200 HTTP Tunnel to www.facebook.com:443 269 200 HTTP Tunnel to www.imaginelearning.com... 270 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 3 271 200 HTTP Tunnel to distillery.wistia.com:443 272 200 HTTPS www.google-analyti... /j/collect?v=1&_v=j96&a... 273 200 HTTPS www.facebook.com /tr/?id=79395028740290... 274 200 HTTPS www.facebook.com /tr/?id=79395028740290... 275 200 HTTP Tunnel to pipedream.wistia.com:443 276 200 HTTP Tunnel to stats.g.doubleclick.net:443 277 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 2 278 200 HTTP Tunnel to fg8vvsvnieiv3ej16jby.litix... 279 200 HTTPS stats.g.doubleclick.... /j/collect?t=dc&aip=1&_r... 280 404 HTTPS www.imaginelearnin... /themes/custom/ilws_corp... 281 204 HTTPS distillery.wistia.com /x 282 200 HTTPS embed-fastly.wistia... /deliveries/068170664e31... 2 283 200 HTTPS pipedream.wistia.com /mput?topic=metrics Request Headers GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1 **Client** Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36 **Miscellaneous** Referer: https://www.imaginelearning.com/ **Security** Origin: https://www.imaginelearning.com sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96" sec-ch-ua-mobile: ?0 Response Headers HTTP/1.1 200 OK **Cache** Age: 550009 cache-control: max-age=31536000 Date: Wed, 15 Dec 2021 04:28:39 GMT expires: Thu, 08 Dec 2022 19:41:50 GMT X-Cache: HIT, HIT X-Cache-Hits: 1, 1 **Entity** Content-Length: 376376 content-type: video/MP2T last-modified: Mon, 05 Nov 2018 10:11:00 GMT Get Started Statistics Inspectors AutoResponder Composer Fiddler Orchestra Beta FiddlerScript Log Filters Timeline Headers TextView SyntaxView WebForms HexView Auth Cookies Raw JSON XML Transformer Headers TextView SyntaxView ImageView HexView WebView Auth Caching Cookies Raw JSON XML *Source: Packet capture by Fiddler tool*  # Result Protocol Host URL 73 200 HTTPS cdn-websites.imagi... /corporate/sites/default/fi... 74 200 HTTP Tunnel to fast.wistia.net:443 75 200 HTTP Tunnel to fast.wistia.net:443 76 200 HTTP Tunnel to fast.wistia.net:443 77 200 HTTPS fast.wistia.net /embed/medias/g1tkcdpn... 78 200 HTTPS fast.wistia.net /assets/external/wistia-m... 79 200 HTTPS fast.wistia.net /embed/medias/g1tkcdpn... 80 200 HTTP Tunnel to azeus1-client-s.gateway.... 81 200 HTTP Tunnel to v10.events.data.microsof... 82 200 HTTP Tunnel to clientservices.googleapis.... 83 200 HTTP Tunnel to embed-fastly.wistia.com:... 84 200 HTTPS clientservices.googl... /uma/v2 85 200 HTTP Tunnel to m.stripe.com:443 86 200 HTTPS embed-fastly.wistia... /deliveries/1d1468c0006c... Request Headers GET /embed/medias/g1tkcdpnot.json?callback=wistiajson1 HTTP/1.1 **Client** Accept: */* Accept-Encoding: gzip, deflate, br Accept-Language: en-US,en;q=0.9 User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36 **Miscellaneous** Referer: https://www.imaginelearning.com/ **Security** sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96" sec-ch-ua-mobile: ?0 sec-ch-ua-platform: "Windows" Get Started Statistics Inspectors AutoResponder Composer Fiddler Orchestra Beta FiddlerScript Log Filters Timeline Headers TextView SyntaxView WebForms HexView Auth Cookies Raw JSON XML *Source: Packet capture by Fiddler tool*

<table>
<tr><th>7,848,328</th><th>Imagine Learning (“Accused Instrumentality”)</th></tr>
<tr><td></td><td>



#	Result	Protocol	Host	URL	
256	200	HTTPS	cdn-websites.imagi...	/corporate/themes/custo...	
257	200	HTTP	Tunnel to	fg8vvsvnieiv3ej16jby.litix...	
258	200	HTTP	Tunnel to	embed-fastly.wistia.com:...	
259	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	
260	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	3
261	200	HTTPS	fg8vvsvnieiv3ej16j...	/	
262	200	HTTP	Tunnel to	embed-fastly.wistia.com:...	
263	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
264	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	1
265	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
266	200	HTTP	Tunnel to	www.google-analytics.co...	
267	200	HTTP	Tunnel to	www.facebook.com:443	
268	200	HTTP	Tunnel to	www.facebook.com:443	
269	200	HTTP	Tunnel to	www.imaginelearning.com...	
270	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	3
271	200	HTTP	Tunnel to	distillery.wistia.com:443	
272	200	HTTPS	www.google-analyti...	/j/collect?v=1&_v=j96&a...	
273	200	HTTPS	www.facebook.com	/tr/?id=79395028740290...	
274	200	HTTPS	www.facebook.com	/tr/?id=79395028740290...	
275	200	HTTP	Tunnel to	pipedream.wistia.com:443	
276	200	HTTP	Tunnel to	stats.g.doubleclick.net:443	
277	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
278	200	HTTP	Tunnel to	fg8vvsvnieiv3ej16jby.litix...	
279	200	HTTPS	stats.g.doubleclick....	/j/collect?t=dc&aip=1&_r...	
280	404	HTTPS	www.imaginelearnin...	/themes/custom/ilws_corp...	
281	204	HTTPS	distillery.wistia.com	/x	
282	200	HTTPS	embed-fastly.wistia...	/deliveries/068170664e31...	2
283	200	HTTPS	pipedream.wistia.com	/mput?topic=metrics	
284	200	HTTP	Tunnel to	www.google.com:443	

Request Headers

GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1

Client

Accept: */*
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36

Miscellaneous

Referer: https://www.imaginelearning.com/

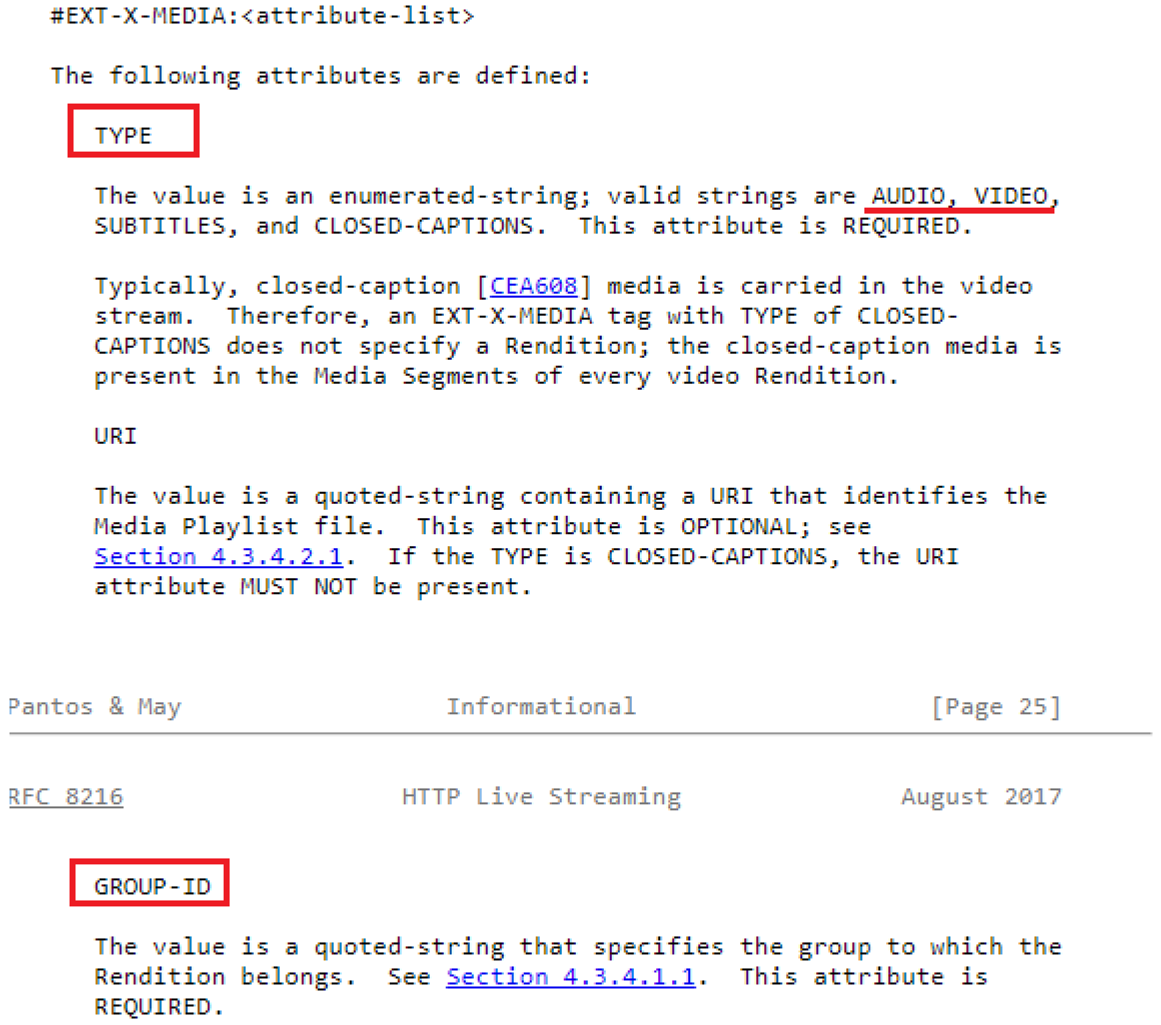
Security

Origin: https://www.imaginelearning.com
sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
sec-ch-ua-mobile: ?0

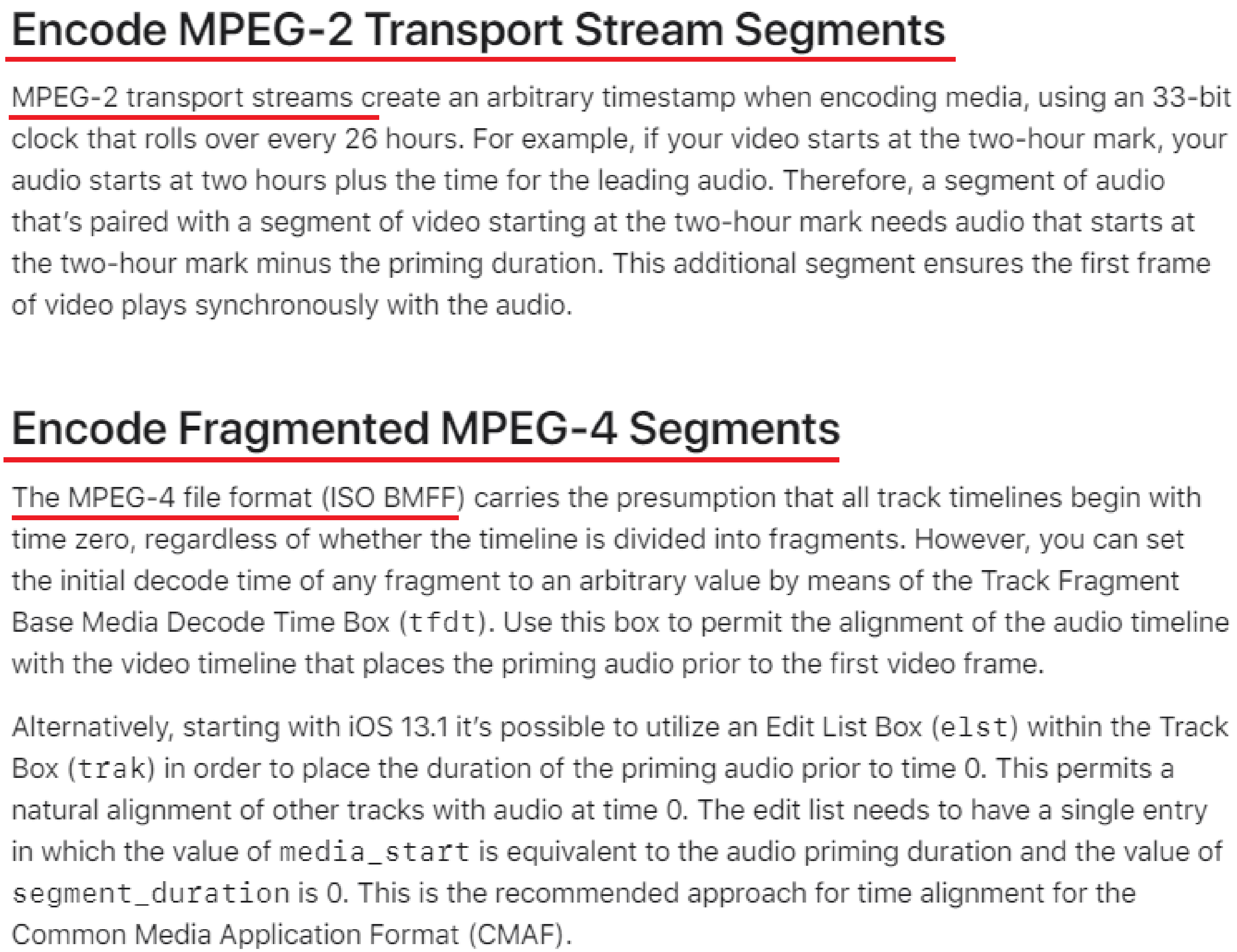
```
00000000  48 54 54 50 2F 31 2E 31 20 32 30 30 20 4F 4B 0D 0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 6B 65 65 70  HTTP/1.1 200 OK..Connection: keep
00000021  2D 61 6C 69 76 65 0D 0A 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 3A 20 33 37 36 33 37 36 0D 0A 63  -alive..Content-Length: 376376..c
00000042  6F 6E 74 65 6E 74 2D 74 79 70 65 3A 20 76 69 64 65 6F 2F 4D 50 32 54 0D 0A 65 78 70 69 72 65 73 3A  ontent-type: video/MP2T..expires:
00000063  20 54 68 75 2C 20 30 38 20 44 65 63 20 32 30 32 32 20 31 39 3A 34 31 3A 35 30 20 47 4D 54 0D 0A 63   Thu, 08 Dec 2022 19:41:50 GMT..c
00000084  61 63 68 65 2D 63 6F 6E 74 72 6F 6C 3A 20 6D 61 78 2D 61 67 65 3D 33 31 35 33 36 30 30 30 0D 0A 61  ache-control: max-age=31536000..a
000000A5  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 61 6C 6C 6F 77 2D 68 65 61 64 65 72 73 3A 20 2A 0D 0A 61  ccess-control-allow-headers: *..a
000000C6  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 65 78 70 6F 73 65 2D 68 65 61 64 65 72 73 3A 20 53 65 72  ccess-control-expose-headers: Ser
000000E7  76 65 72 2C 72 61 6E 67 65 2C 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 2C 43 6F 6E 74 65 6E 74 2D  ver,range,Content-Length,Content-
00000108  52 61 6E 67 65 0D 0A 6C 61 73 74 2D 6D 6F 64 69 66 69 65 64 3A 20 4D 6F 6E 2C 20 30 35 20 4E 6F 76  Range..last-modified: Mon, 05 Nov
00000129  20 32 30 31 38 20 31 30 3A 31 31 3A 30 30 20 47 4D 54 0D 0A 65 64 67 65 2D 63 61 63 68 65 2D 74 61   2018 10:11:00 GMT..edge-cache-ta
0000014A  67 3A 20 30 36 38 31 37 30 36 36 34 65 33 31 65 65 66 33 36 33 34 38 33 31 35 34 34 32 65 33 31 32  g: 068170664e31eef36348315442e312
0000016B  37 38 37 33 39 37 35 62 35 39 20 70 75 72 67 65 2D 65 78 70 65 72 69 6D 65 6E 74 2D 35 39 0D 0A 56  7873975b59 purge-experiment-59..V
0000018C  69 61 3A 20 31 2E 31 20 76 61 72 6E 69 73 68 2C 20 31 2E 31 20 76 61 72 6E 69 73 68 0D 0A 41 63 63  ia: 1.1 varnish, 1.1 varnish..Acc
000001AD  65 70 74 2D 52 61 6E 67 65 73 3A 20 62 79 74 65 73 0D 0A 44 61 74 65 3A 20 57 65 64 2C 20 31 35 20  ept-Ranges: bytes..Date: Wed, 15 
000001CE  44 65 63 20 32 30 32 31 20 30 34 3A 32 38 3A 33 39 20 47 4D 54 0D 0A 41 67 65 3A 20 35 35 30 30 30  Dec 2021 04:28:39 GMT..Age: 55000
000001EF  39 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 41 6C 6C 6F 77 2D 4F 72 69 67 69 6E 3A 20 2A  9..Access-Control-Allow-Origin: *
00000210  0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 52 65 71 75 65 73 74 2D 4D 65 74 68 6F 64 3A 20  ..Access-Control-Request-Method: 
```

Source: Packet capture by Fiddler tool

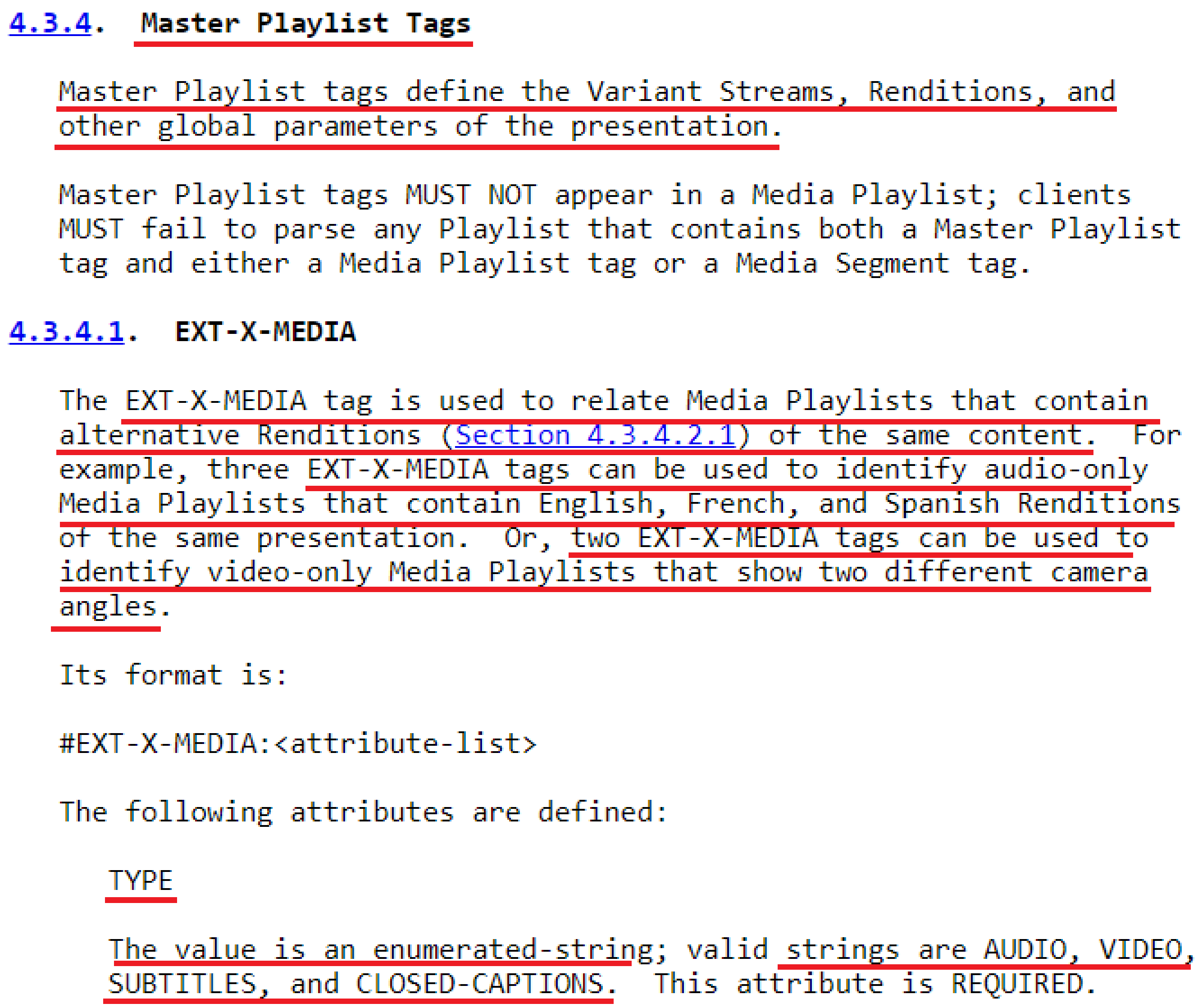
</td></tr>
</table>

7,848,328	Imagine Learning ("Accused Instrumentality")
	 #EXT-X-MEDIA:<attribute-list> The following attributes are defined: TYPE The value is an enumerated-string; valid strings are AUDIO, VIDEO, SUBTITLES, and CLOSED-CAPTIONS. This attribute is REQUIRED. Typically, closed-caption [CEA608] media is carried in the video stream. Therefore, an EXT-X-MEDIA tag with TYPE of CLOSED-CAPTIONS does not specify a Rendition; the closed-caption media is present in the Media Segments of every video Rendition. URI The value is a quoted-string containing a URI that identifies the Media Playlist file. This attribute is OPTIONAL; see Section 4.3.4.2.1. If the TYPE is CLOSED-CAPTIONS, the URI attribute MUST NOT be present. Pantos & May Informational [Page 25] RFC 8216 HTTP Live Streaming August 2017 GROUP-ID The value is a quoted-string that specifies the group to which the Rendition belongs. See Section 4.3.4.1.1. This attribute is REQUIRED. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning ("Accused Instrumentality")

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 Encode MPEG-2 Transport Stream Segments MPEG-2 transport streams create an arbitrary timestamp when encoding media, using an 33-bit clock that rolls over every 26 hours. For example, if your video starts at the two-hour mark, your audio starts at two hours plus the time for the leading audio. Therefore, a segment of audio that’s paired with a segment of video starting at the two-hour mark needs audio that starts at the two-hour mark minus the priming duration. This additional segment ensures the first frame of video plays synchronously with the audio. Encode Fragmented MPEG-4 Segments The MPEG-4 file format (ISO BMFF) carries the presumption that all track timelines begin with time zero, regardless of whether the timeline is divided into fragments. However, you can set the initial decode time of any fragment to an arbitrary value by means of the Track Fragment Base Media Decode Time Box (`tfdt`). Use this box to permit the alignment of the audio timeline with the video timeline that places the priming audio prior to the first video frame. Alternatively, starting with iOS 13.1 it’s possible to utilize an Edit List Box (`elst`) within the Track Box (`trak`) in order to place the duration of the priming audio prior to time 0. This permits a natural alignment of other tracks with audio at time 0. The edit list needs to have a single entry in which the value of `media_start` is equivalent to the audio priming duration and the value of `segment_duration` is 0. This is the recommended approach for time alignment for the Common Media Application Format (CMAF).

7,848,328	Imagine Learning ("Accused Instrumentality")
	https://developer.apple.com/documentation/http_live_streaming/preparing_audio_for_http_live_streaming



4.3.4. Master Playlist Tags

Master Playlist tags define the Variant Streams, Renditions, and other global parameters of the presentation.

Master Playlist tags MUST NOT appear in a Media Playlist; clients MUST fail to parse any Playlist that contains both a Master Playlist tag and either a Media Playlist tag or a Media Segment tag.

4.3.4.1. EXT-X-MEDIA

The EXT-X-MEDIA tag is used to relate Media Playlists that contain alternative Renditions (Section 4.3.4.2.1) of the same content. For example, three EXT-X-MEDIA tags can be used to identify audio-only Media Playlists that contain English, French, and Spanish Renditions of the same presentation. Or, two EXT-X-MEDIA tags can be used to identify video-only Media Playlists that show two different camera angles.

Its format is:

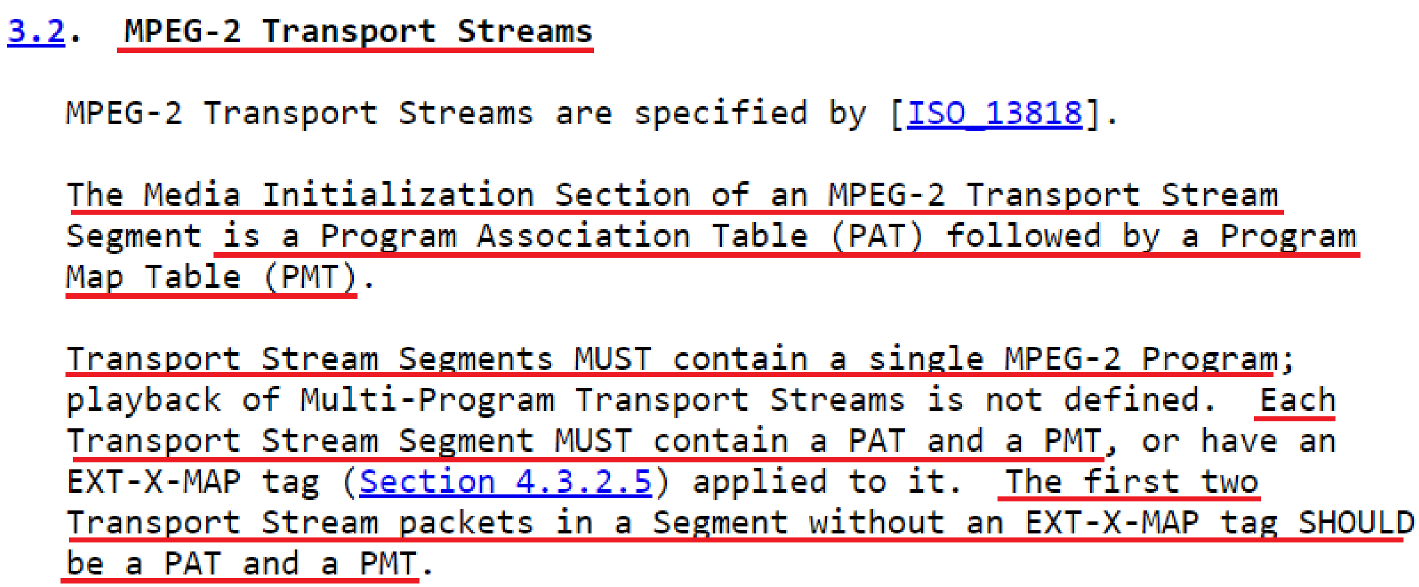
#EXT-X-MEDIA:<attribute-list>

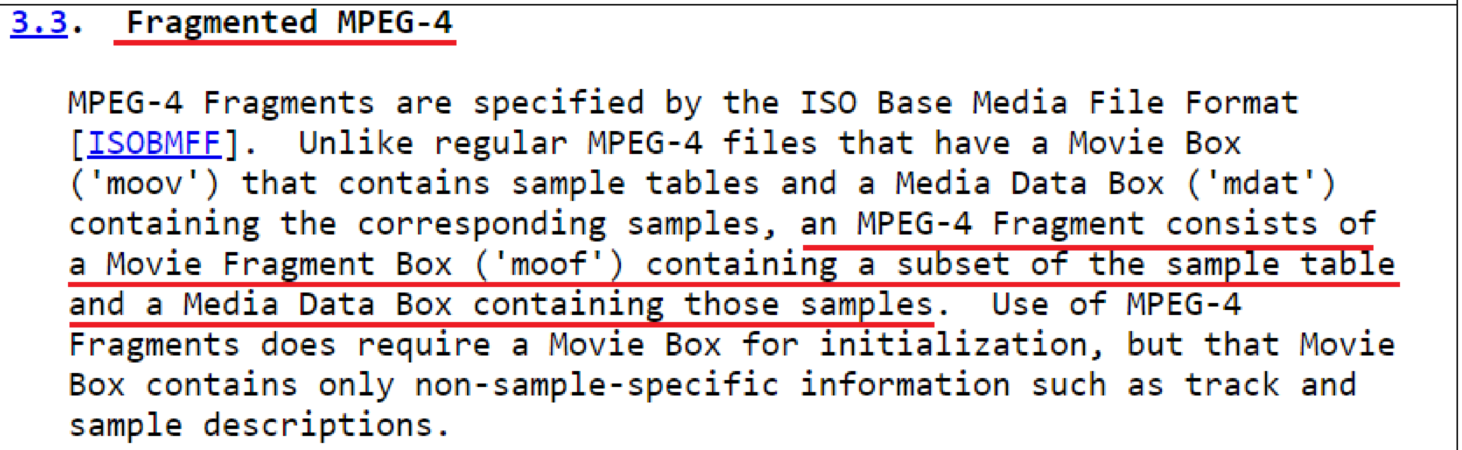
The following attributes are defined:

TYPE

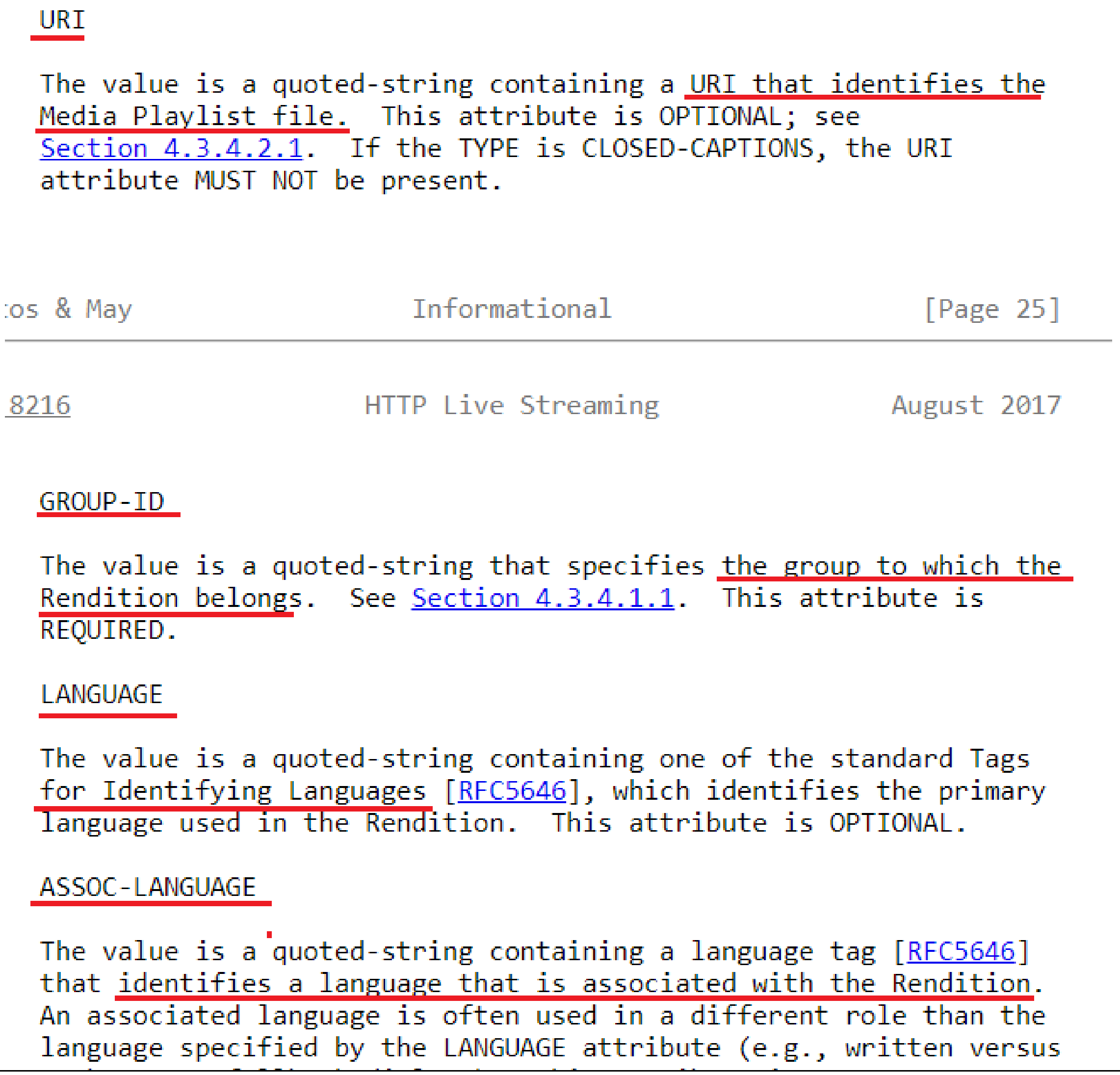
The value is an enumerated-string; valid strings are AUDIO, VIDEO, SUBTITLES, and CLOSED-CAPTIONS. This attribute is REQUIRED.

https://datatracker.ietf.org/doc/html/rfc8216

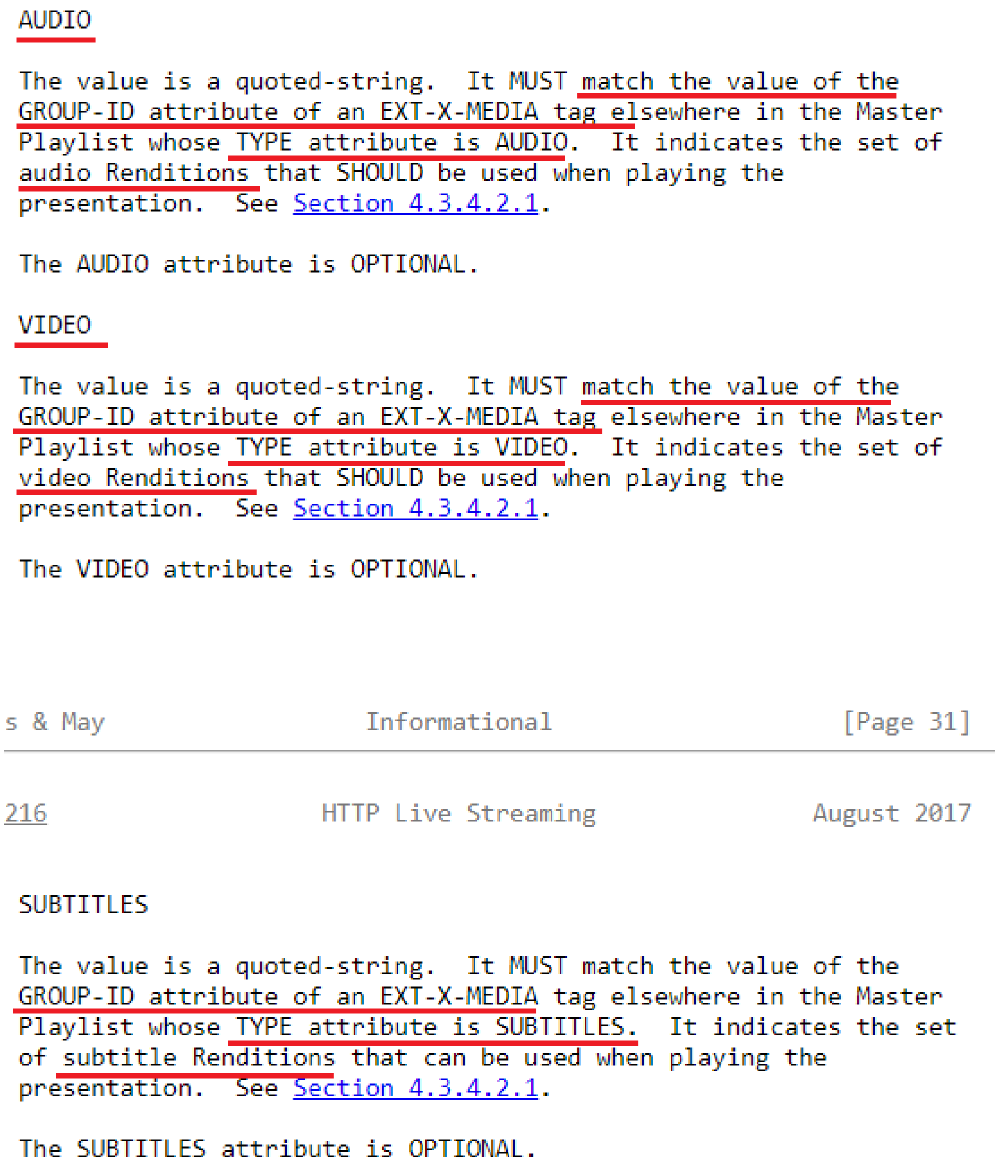
7,848,328	Imagine Learning (“Accused Instrumentality”)
	 3.2. MPEG-2 Transport Streams MPEG-2 Transport Streams are specified by [ISO_13818]. The Media Initialization Section of an MPEG-2 Transport Stream Segment is a Program Association Table (PAT) followed by a Program Map Table (PMT). Transport Stream Segments MUST contain a single MPEG-2 Program; playback of Multi-Program Transport Streams is not defined. Each Transport Stream Segment MUST contain a PAT and a PMT, or have an EXT-X-MAP tag (Section 4.3.2.5) applied to it. The first two Transport Stream packets in a Segment without an EXT-X-MAP tag SHOULD be a PAT and a PMT. https://datatracker.ietf.org/doc/html/rfc8216

7,848,328	Imagine Learning ("Accused Instrumentality")
	 3.3. Fragmented MPEG-4 MPEG-4 Fragments are specified by the ISO Base Media File Format [ISOBMFF]. Unlike regular MPEG-4 files that have a Movie Box ('moov') that contains sample tables and a Media Data Box ('mdat') containing the corresponding samples, an MPEG-4 Fragment consists of a Movie Fragment Box ('moof') containing a subset of the sample table and a Media Data Box containing those samples. Use of MPEG-4 Fragments does require a Movie Box for initialization, but that Movie Box contains only non-sample-specific information such as track and sample descriptions. https://datatracker.ietf.org/doc/html/rfc8216

Preliminary charts based on best available information

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 URI The value is a quoted-string containing a URI that identifies the Media Playlist file. This attribute is OPTIONAL; see Section 4.3.4.2.1. If the TYPE is CLOSED-CAPTIONS, the URI attribute MUST NOT be present. :os & May Informational [Page 25] 8216 HTTP Live Streaming August 2017 GROUP-ID The value is a quoted-string that specifies the group to which the Rendition belongs. See Section 4.3.4.1.1. This attribute is REQUIRED. LANGUAGE The value is a quoted-string containing one of the standard Tags for Identifying Languages [RFC5646], which identifies the primary language used in the Rendition. This attribute is OPTIONAL. ASSOC-LANGUAGE The value is a quoted-string containing a language tag [RFC5646] that identifies a language that is associated with the Rendition. An associated language is often used in a different role than the language specified by the LANGUAGE attribute (e.g., written versus

7,848,328	Imagine Learning ("Accused Instrumentality")
	https://datatracker.ietf.org/doc/html/rfc8216



AUDIO

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is AUDIO. It indicates the set of audio Renditions that SHOULD be used when playing the presentation. See Section 4.3.4.2.1.

The AUDIO attribute is OPTIONAL.

VIDEO

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is VIDEO. It indicates the set of video Renditions that SHOULD be used when playing the presentation. See Section 4.3.4.2.1.

The VIDEO attribute is OPTIONAL.

```
s & May                     Informational                    [Page 31]
```

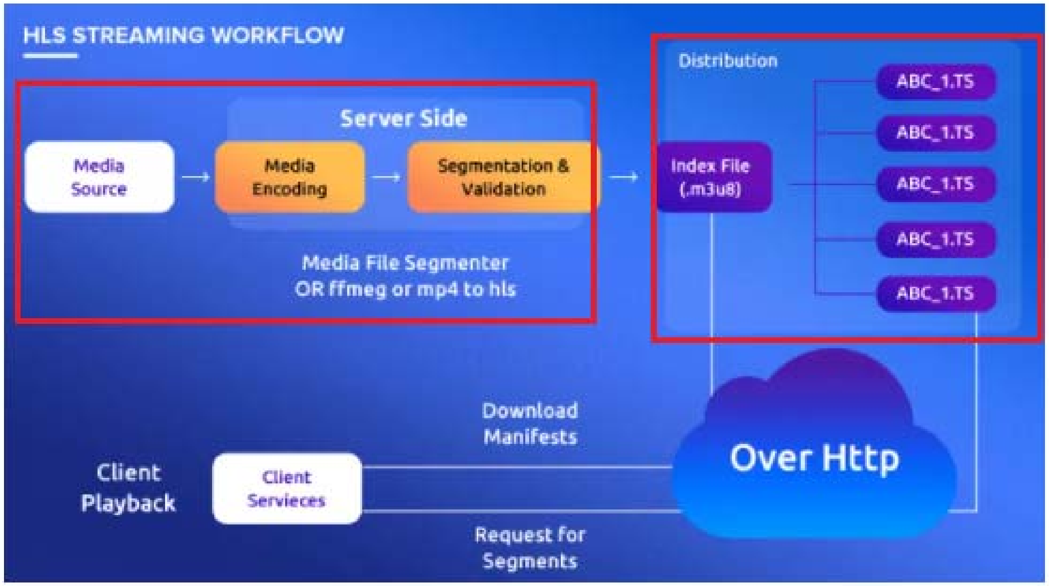
```
216                      HTTP Live Streaming                August 2017
```

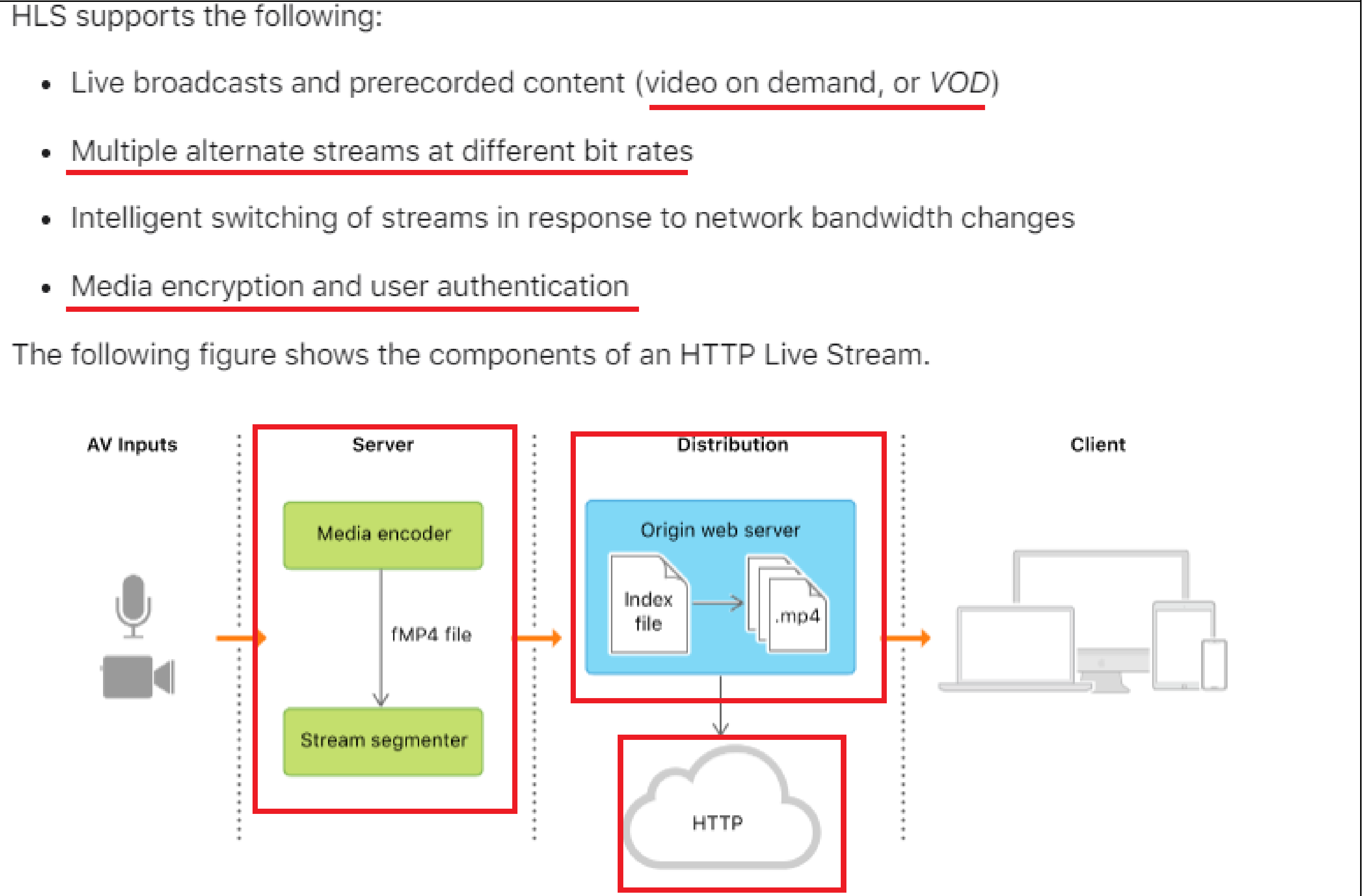
SUBTITLES

The value is a quoted-string. It MUST match the value of the GROUP-ID attribute of an EXT-X-MEDIA tag elsewhere in the Master Playlist whose TYPE attribute is SUBTITLES. It indicates the set of subtitle Renditions that can be used when playing the presentation. See Section 4.3.4.2.1.

The SUBTITLES attribute is OPTIONAL.

Preliminary charts based on best available information

7,848,328	Imagine Learning ("Accused Instrumentality")
	https://datatracker.ietf.org/doc/html/rfc8216
and forwarding the packet streams for transmission in a transmission channel,	The accused standard discloses forwarding the packet streams (e.g., m3u8 data packet stream) for transmission in a transmission channel (e.g., wired/wireless transmission).  HLS STREAMING WORKFLOW Server Side Media Source Media Encoding Segmentation & Validation Media File Segmenter OR ffmeg or mp4 to hls Distribution Index File (.m3u8) ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS Download Manifests Over Http Client Playback Client Servieces Request for Segments https://martech.zone/http-live-streaming-player-features/

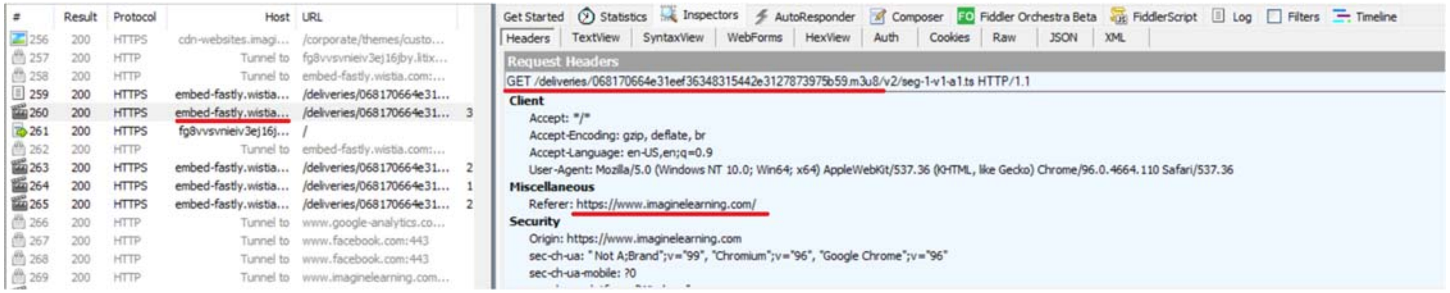
7,848,328	Imagine Learning ("Accused Instrumentality")
	 HLS supports the following: • Live broadcasts and prerecorded content (video on demand, or *VOD*) • Multiple alternate streams at different bit rates • Intelligent switching of streams in response to network bandwidth changes • Media encryption and user authentication The following figure shows the components of an HTTP Live Stream. AV Inputs Server Media encoder fMP4 file Stream segmenter Distribution Origin web server Index file .mp4 HTTP Client https://developer.apple.com/documentation/http_live_streaming
and wherein the mapping further	The accused standard discloses wherein the mapping further comprises assigning a specific value (e.g., value corresponding to different media stream) to each component for a predefined field of a packet (e.g., segment info)

<table>
<tr><th>7,848,328</th><th>Imagine Learning (“Accused Instrumentality”)</th></tr>
<tr><td>comprises assigning a specific value to each component for a predefined field of a packet according to a second communication protocol, the specific value distinguishing the component from other components, and</td><td>according to a second communication protocol (e.g., HTTP/Hypertext transfer protocol), the specific value (e.g., value corresponding to different media stream) distinguishing the component from other components.

As shown below, the accused standard provides m3u8 index file with multiple media playlists. Each media playlist has many representations, wherein every representation has many segments, these segments contains media information of each conversion corresponding to that media playlist.

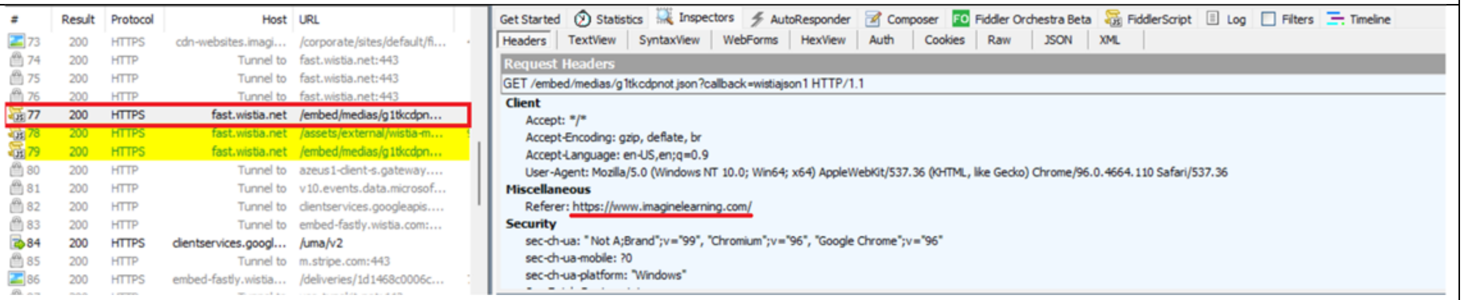
The accused standard provides each segment having information related to a particular HTTP based uniform resource locator for getting a media stream from that particular address.

For the video segment shown below, the base URL is https://embed-fastly.wistia.com/ and the specific value is “deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts" (http based).


Get Started
Statistics
Inspectors
AutoResponder
Composer
Fiddler Orchestra Beta
FiddlerScript
Log
Filters
Timeline
Headers
TextView
SyntaxView
WebForms
HexView
Auth
Cookies
Raw
JSON
XML
<table>
<tr><th>#</th><th>Result</th><th>Protocol</th><th>Host</th><th>URL</th><th></th></tr>
<tr><td>256</td><td>200</td><td>HTTPS</td><td>cdn-websites.imagi...</td><td>/corporate/themes/custo...</td><td></td></tr>
<tr><td>257</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>fg8vvsvnieiv3ej16jby.litix...</td><td></td></tr>
<tr><td>258</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>embed-fastly.wistia.com:...</td><td></td></tr>
<tr><td>259</td><td>200</td><td>HTTPS</td><td>embed-fastly.wistia...</td><td>/deliveries/068170664e31...</td><td></td></tr>
<tr><td>260</td><td>200</td><td>HTTPS</td><td>embed-fastly.wistia...</td><td>/deliveries/068170664e31...</td><td>3</td></tr>
<tr><td>261</td><td>200</td><td>HTTPS</td><td>fg8vvsvnieiv3ej16j...</td><td>/</td><td></td></tr>
<tr><td>262</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>embed-fastly.wistia.com:...</td><td></td></tr>
<tr><td>263</td><td>200</td><td>HTTPS</td><td>embed-fastly.wistia...</td><td>/deliveries/068170664e31...</td><td>2</td></tr>
<tr><td>264</td><td>200</td><td>HTTPS</td><td>embed-fastly.wistia...</td><td>/deliveries/068170664e31...</td><td>1</td></tr>
<tr><td>265</td><td>200</td><td>HTTPS</td><td>embed-fastly.wistia...</td><td>/deliveries/068170664e31...</td><td>2</td></tr>
<tr><td>266</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>www.google-analytics.co...</td><td></td></tr>
<tr><td>267</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>www.facebook.com:443</td><td></td></tr>
<tr><td>268</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>www.facebook.com:443</td><td></td></tr>
<tr><td>269</td><td>200</td><td>HTTP</td><td>Tunnel to</td><td>www.imaginelearning.com...</td><td></td></tr>
</table>
Request Headers
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
Accept: */*
Accept-Encoding: gzip, deflate, br
Accept-Language: en-US,en;q=0.9
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
Referer: https://www.imaginelearning.com/
Security
Origin: https://www.imaginelearning.com
sec-ch-ua: "Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
sec-ch-ua-mobile: ?0

Source: Packet capture by Fiddler tool</td></tr>
</table>

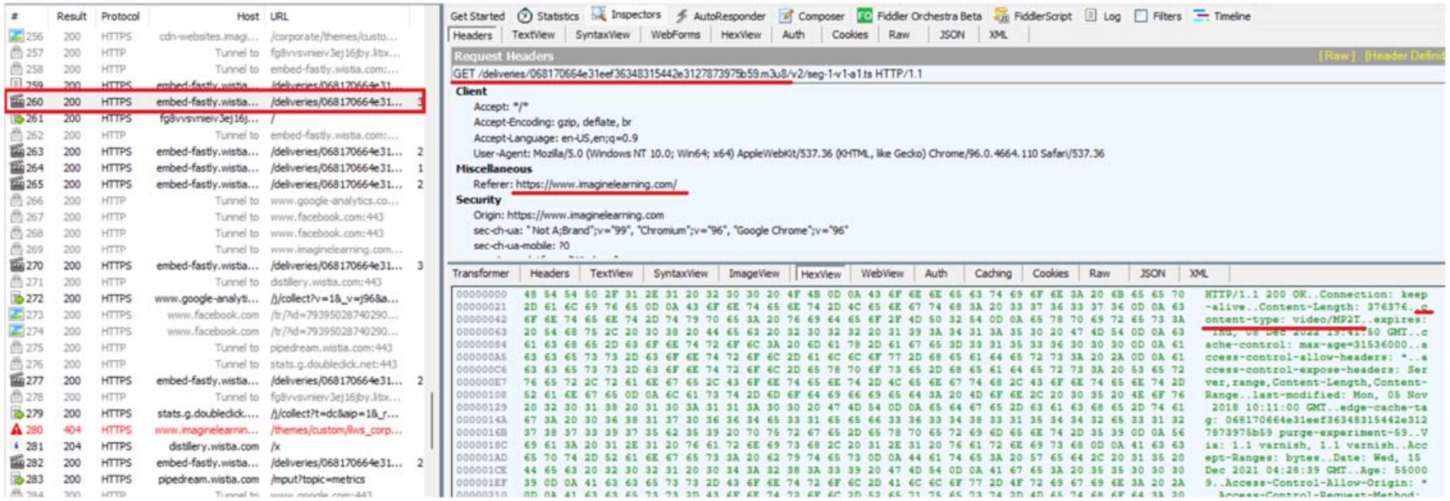
7,848,328	Imagine Learning (“Accused Instrumentality”)



```
#     Result  Protocol  Host                      URL
73    200     HTTPS     cdn-websites.imagi...     /corporate/sites/default/fi...
74    200     HTTP      Tunnel to                 fast.wistia.net:443
75    200     HTTP      Tunnel to                 fast.wistia.net:443
76    200     HTTP      Tunnel to                 fast.wistia.net:443
77    200     HTTPS     fast.wistia.net           /embed/medias/g1tkcdpn...
78    200     HTTPS     fast.wistia.net           /assets/external/wistia-m...
79    200     HTTPS     fast.wistia.net           /embed/medias/g1tkcdpn...
80    200     HTTP      Tunnel to                 azeus1-client-s.gateway....
81    200     HTTP      Tunnel to                 v10.events.data.microsof...
82    200     HTTP      Tunnel to                 clientservices.googleapis....
83    200     HTTP      Tunnel to                 embed-fastly.wistia.com:...
84    200     HTTPS     clientservices.googl...   /uma/v2
85    200     HTTP      Tunnel to                 m.stripe.com:443
86    200     HTTPS     embed-fastly.wistia...    /deliveries/1d1468c0006c...
```

```
Request Headers
GET /embed/medias/g1tkcdpnot.json?callback=wistiajson1 HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
    sec-ch-ua-platform: "Windows"
```

Source: Packet capture by Fiddler tool

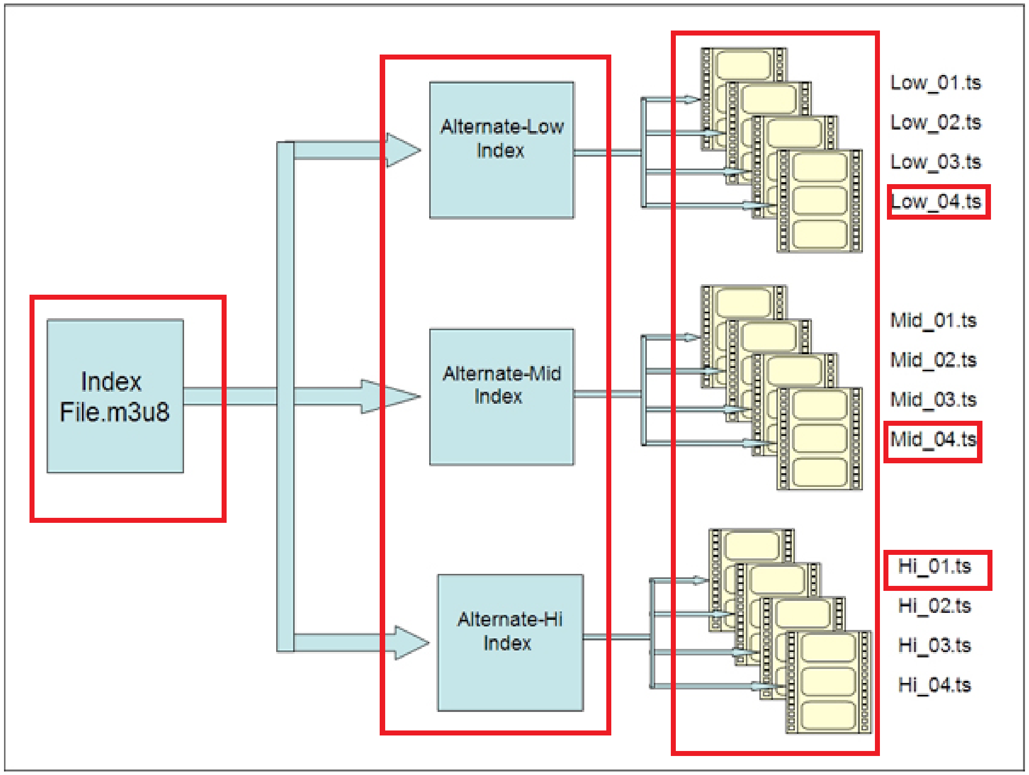


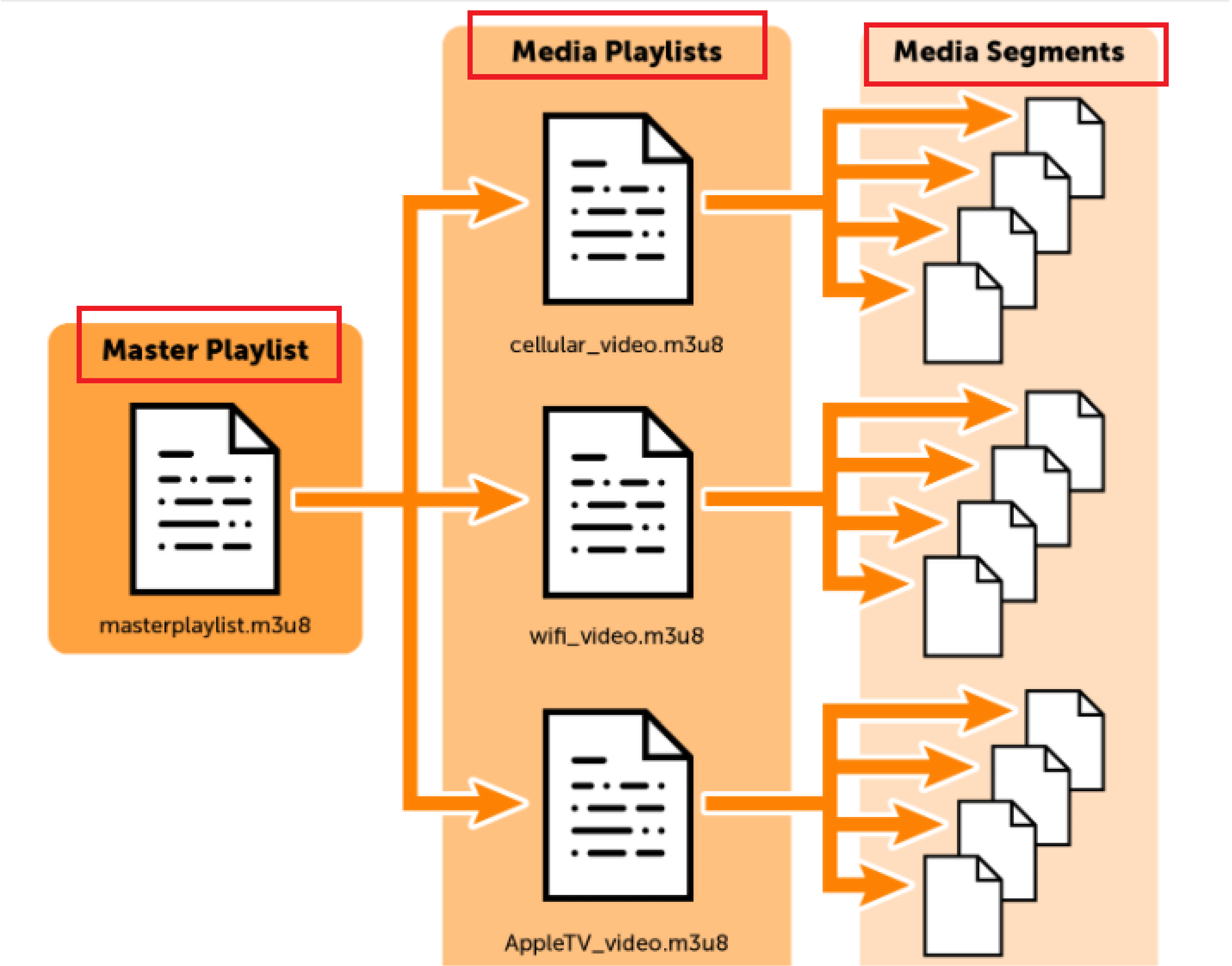
```
#     Result  Protocol  Host                      URL
256   200     HTTPS     cdn-websites.imagi...     /corporate/themes/custo...
257   200     HTTP      Tunnel to                 fg8vvsvnieiv3ej16jby.litix...
258   200     HTTP      Tunnel to                 embed-fastly.wistia.com:...
259   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...
260   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   3
261   200     HTTPS     fg8vvsvnieiv3ej16j...     /
262   200     HTTP      Tunnel to                 embed-fastly.wistia.com:...
263   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   2
264   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   1
265   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   2
266   200     HTTP      Tunnel to                 www.google-analytics.co...
267   200     HTTP      Tunnel to                 www.facebook.com:443
268   200     HTTP      Tunnel to                 www.facebook.com:443
269   200     HTTP      Tunnel to                 www.imaginelearning.com...
270   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   3
271   200     HTTP      Tunnel to                 distillery.wistia.com:443
272   200     HTTPS     www.google-analyti...     /j/collect?v=1&_v=j96&a...
273   200     HTTPS     www.facebook.com          /tr/?id=79395028740290...
274   200     HTTPS     www.facebook.com          /tr/?id=79395028740290...
275   200     HTTP      Tunnel to                 pipedream.wistia.com:443
276   200     HTTP      Tunnel to                 stats.g.doubleclick.net:443
277   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   2
278   200     HTTP      Tunnel to                 fg8vvsvnieiv3ej16jby.litix...
279   200     HTTPS     stats.g.doubleclick....   /j/collect?t=dc&aip=1&_r...
280   404     HTTPS     www.imaginelearnin...     /themes/custom/ilws_corp...
281   204     HTTPS     distillery.wistia.com     /x
282   200     HTTPS     embed-fastly.wistia...    /deliveries/068170664e31...   2
283   200     HTTPS     pipedream.wistia.com      /mput?topic=metrics
284   200     HTTP      Tunnel to                 www.google.com:443
```

```
Request Headers
GET /deliveries/068170664e31eef36348315442e3127873975b59.m3u8/v2/seg-1-v1-a1.ts HTTP/1.1
Client
    Accept: */*
    Accept-Encoding: gzip, deflate, br
    Accept-Language: en-US,en;q=0.9
    User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36
Miscellaneous
    Referer: https://www.imaginelearning.com/
Security
    Origin: https://www.imaginelearning.com
    sec-ch-ua: " Not A;Brand";v="99", "Chromium";v="96", "Google Chrome";v="96"
    sec-ch-ua-mobile: ?0
```

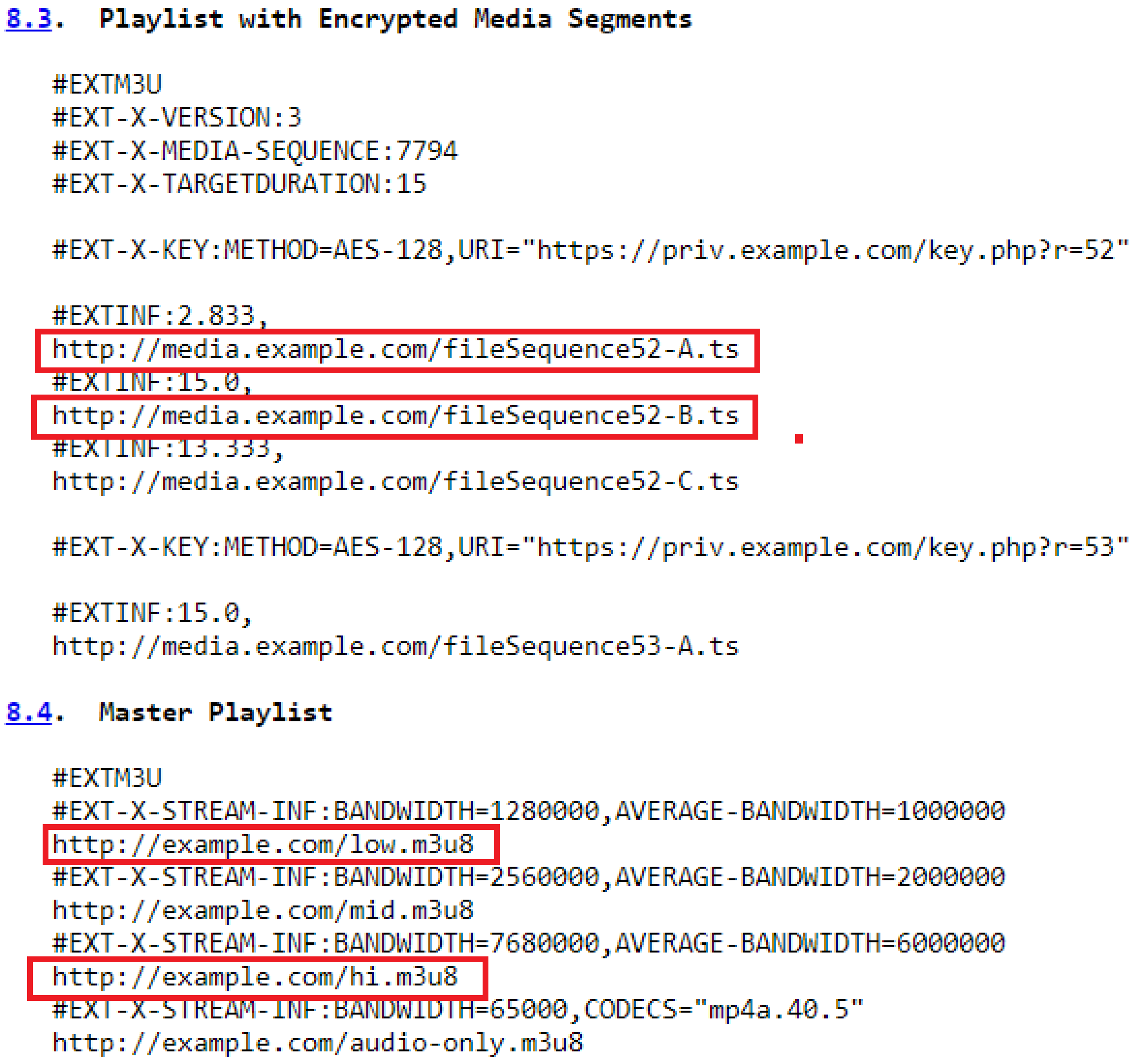
```
00000000  48 54 54 50 2F 31 2E 31 20 32 30 30 20 4F 4B 0D 0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 6B 65 65 70   HTTP/1.1 200 OK..Connection: keep
00000021  2D 61 6C 69 76 65 0D 0A 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 3A 20 33 37 36 33 37 36 0D 0A 63   -alive..Content-Length: 376376..c
00000042  6F 6E 74 65 6E 74 2D 74 79 70 65 3A 20 76 69 64 65 6F 2F 4D 50 32 54 0D 0A 65 78 70 69 72 65 73 3A   ontent-type: video/MP2T..expires:
00000063  20 54 68 75 2C 20 30 38 20 44 65 63 20 32 30 32 32 20 31 39 3A 34 31 3A 35 30 20 47 4D 54 0D 0A 63    Thu, 08 Dec 2022 19:41:50 GMT..c
00000084  61 63 68 65 2D 63 6F 6E 74 72 6F 6C 3A 20 6D 61 78 2D 61 67 65 3D 33 31 35 33 36 30 30 30 0D 0A 61   ache-control: max-age=31536000..a
000000A5  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 61 6C 6C 6F 77 2D 68 65 61 64 65 72 73 3A 20 2A 0D 0A 61   ccess-control-allow-headers: *..a
000000C6  63 63 65 73 73 2D 63 6F 6E 74 72 6F 6C 2D 65 78 70 6F 73 65 2D 68 65 61 64 65 72 73 3A 20 53 65 72   ccess-control-expose-headers: Ser
000000E7  76 65 72 2C 72 61 6E 67 65 2C 43 6F 6E 74 65 6E 74 2D 4C 65 6E 67 74 68 2C 43 6F 6E 74 65 6E 74 2D   ver,range,Content-Length,Content-
00000108  52 61 6E 67 65 0D 0A 6C 61 73 74 2D 6D 6F 64 69 66 69 65 64 3A 20 4D 6F 6E 2C 20 30 35 20 4E 6F 76   Range..last-modified: Mon, 05 Nov
00000129  20 32 30 31 38 20 31 30 3A 31 31 3A 30 30 20 47 4D 54 0D 0A 65 64 67 65 2D 63 61 63 68 65 2D 74 61    2018 10:11:00 GMT..edge-cache-ta
0000014A  67 3A 20 30 36 38 31 37 30 36 36 34 65 33 31 65 65 66 33 36 33 34 38 33 31 35 34 34 32 65 33 31 32   g: 068170664e31eef36348315442e312
0000016B  37 38 37 33 39 37 35 62 35 39 20 70 75 72 67 65 2D 65 78 70 65 72 69 6D 65 6E 74 2D 35 39 0D 0A 56   7873975b59 purge-experiment-59..V
0000018C  69 61 3A 20 31 2E 31 20 76 61 72 6E 69 73 68 2C 20 31 2E 31 20 76 61 72 6E 69 73 68 0D 0A 41 63 63   ia: 1.1 varnish, 1.1 varnish..Acc
000001AD  65 70 74 2D 52 61 6E 67 65 73 3A 20 62 79 74 65 73 0D 0A 44 61 74 65 3A 20 57 65 64 2C 20 31 35 20   ept-Ranges: bytes..Date: Wed, 15 
000001CE  44 65 63 20 32 30 32 31 20 30 34 3A 32 38 3A 33 39 20 47 4D 54 0D 0A 41 67 65 3A 20 35 35 30 30 30   Dec 2021 04:28:39 GMT..Age: 55000
000001EF  39 0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 41 6C 6C 6F 77 2D 4F 72 69 67 69 6E 3A 20 2A   9..Access-Control-Allow-Origin: *
00000210  0D 0A 41 63 63 65 73 73 2D 43 6F 6E 74 72 6F 6C 2D 52 65 71 75 65 73 74 2D 4D 65 74 68 6F 64 3A 20   ..Access-Control-Request-Method: 
```

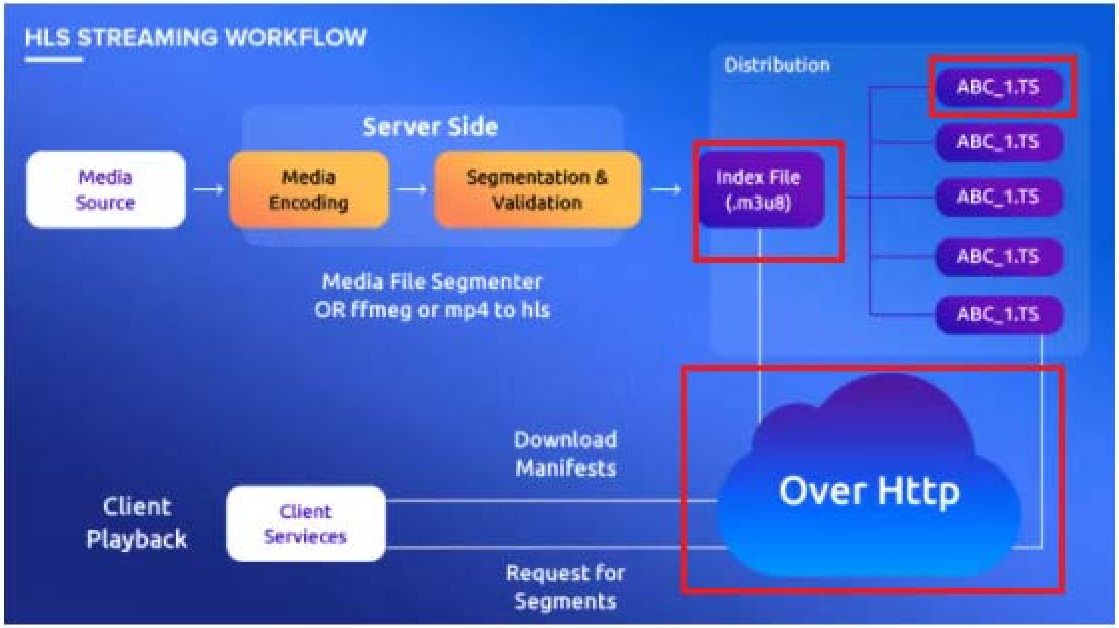
Source: Packet capture by Fiddler tool

7,848,328	Imagine Learning ("Accused Instrumentality")
	 Index File.m3u8 Alternate-Low Index Alternate-Mid Index Alternate-Hi Index Low_01.ts Low_02.ts Low_03.ts Low_04.ts Mid_01.ts Mid_02.ts Mid_03.ts Mid_04.ts Hi_01.ts Hi_02.ts Hi_03.ts Hi_04.ts *Figure 1. HLS uses multiple encoded files with index files directing the player to different streams and chunks of audio/video data within those streams.* https://www.streamingmedia.com/Articles/Editorial/What-Is-.../What-Is-HLS-(HTTP-Live-Streaming)-78221.aspx?utm_source=related_articles&utm_medium=gutenberg&utm_campaign=editors_selection

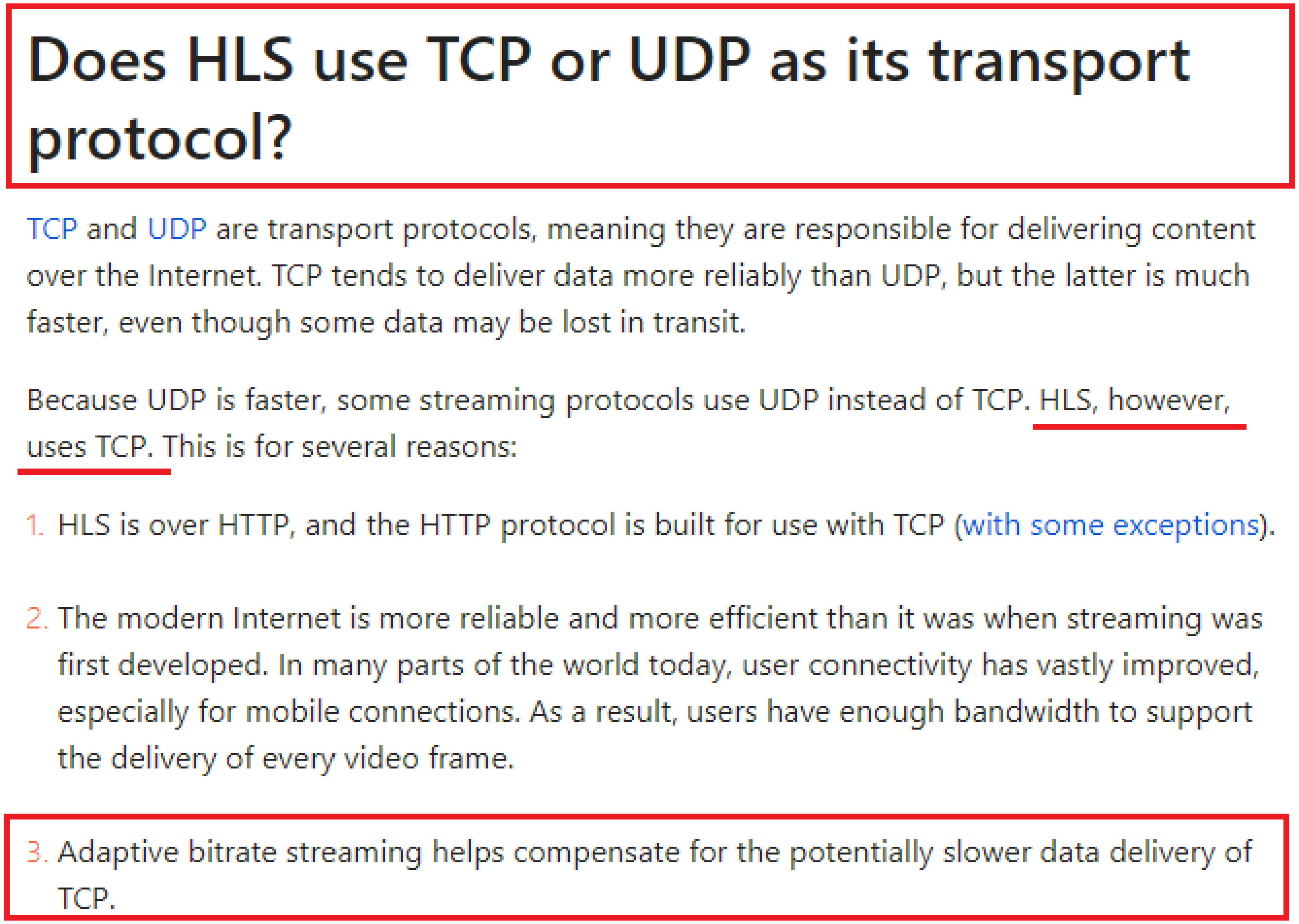
	 Media Playlists Media Segments Master Playlist masterplaylist.m3u8 cellular_video.m3u8 wifi_video.m3u8 AppleTV_video.m3u8 https://www.wowza.com/blog/hls-streaming-protocol

7,848,328	Imagine Learning ("Accused Instrumentality")

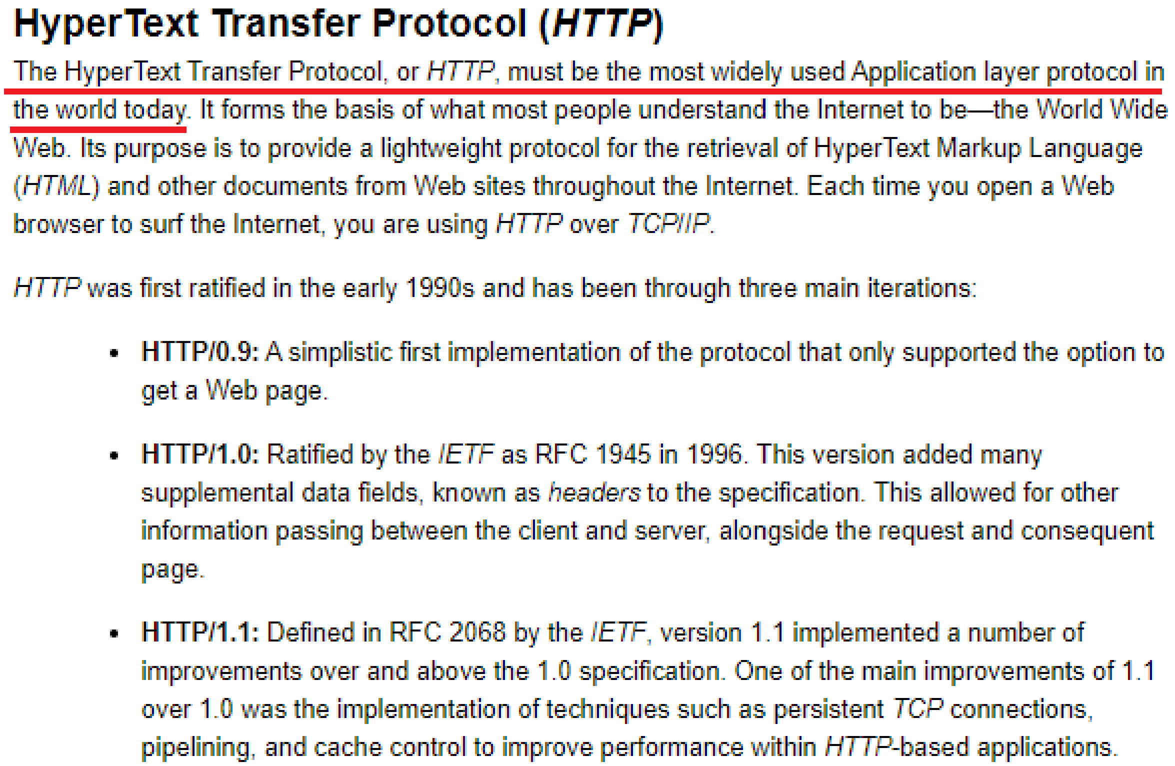
7,848,328	Imagine Learning ("Accused Instrumentality")
	 8.3. Playlist with Encrypted Media Segments #EXTM3U #EXT-X-VERSION:3 #EXT-X-MEDIA-SEQUENCE:7794 #EXT-X-TARGETDURATION:15 #EXT-X-KEY:METHOD=AES-128,URI="https://priv.example.com/key.php?r=52" #EXTINF:2.833, http://media.example.com/fileSequence52-A.ts #EXTINF:15.0, http://media.example.com/fileSequence52-B.ts #EXTINF:13.333, http://media.example.com/fileSequence52-C.ts #EXT-X-KEY:METHOD=AES-128,URI="https://priv.example.com/key.php?r=53" #EXTINF:15.0, http://media.example.com/fileSequence53-A.ts 8.4. Master Playlist #EXTM3U #EXT-X-STREAM-INF:BANDWIDTH=1280000,AVERAGE-BANDWIDTH=1000000 http://example.com/low.m3u8 #EXT-X-STREAM-INF:BANDWIDTH=2560000,AVERAGE-BANDWIDTH=2000000 http://example.com/mid.m3u8 #EXT-X-STREAM-INF:BANDWIDTH=7680000,AVERAGE-BANDWIDTH=6000000 http://example.com/hi.m3u8 #EXT-X-STREAM-INF:BANDWIDTH=65000,CODECS="mp4a.40.5" http://example.com/audio-only.m3u8

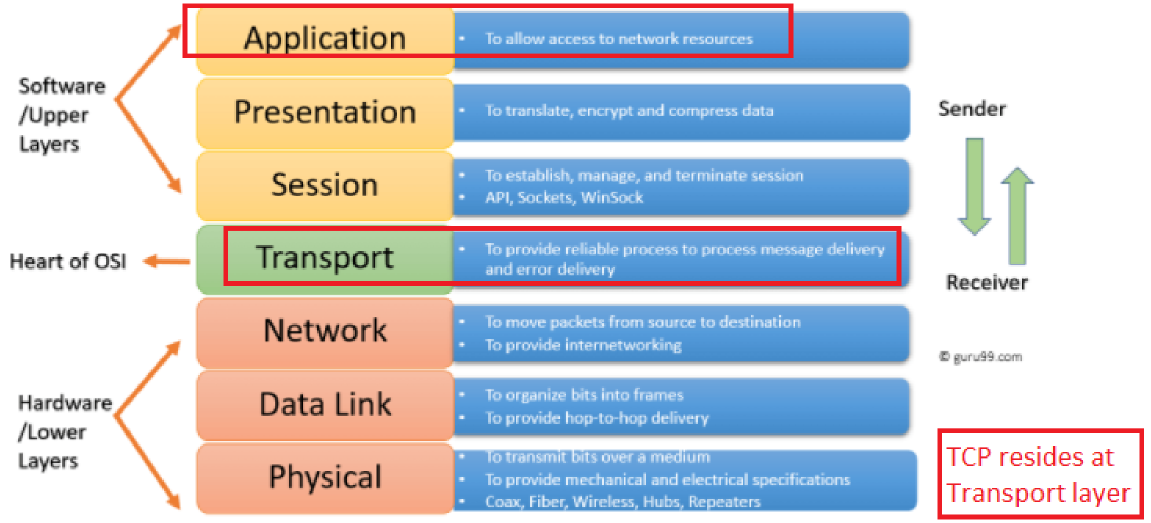
7,848,328	Imagine Learning (“Accused Instrumentality”)
	https://datatracker.ietf.org/doc/html/rfc8216  HLS STREAMING WORKFLOW Distribution Server Side Media Source Media Encoding Segmentation & Validation Index File (.m3u8) ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS ABC_1.TS Media File Segmenter OR ffmeg or mp4 to hls Download Manifests Over Http Client Playback Client Servieces Request for Segments https://martech.zone/http-live-streaming-player-features/
the encapsulating comprises encapsulating the packet streams according to one or more	The accused standard discloses encapsulating comprises encapsulating the packet streams (e.g., data packets in m3u8 file) according to one or more lower layer protocols without encapsulating the packet streams (e.g., data packets in m3u8) according to the second communication protocol (e.g. HTTP Protocol). Further as explained below, the packet streams are encapsulated according to one or more lower layer protocols (e.g., network layer/MAC layer/physical layer) of the device transmitting the packet streams. Since, the packet streams are obtained by TCP encapsulation of data streams and the HTTP protocol doesn’t reside beneath the

7,848,328	Imagine Learning ("Accused Instrumentality")
lower layer protocols without encapsulating the packet streams according to the second communication protocol.	TCP layer, the further encapsulation doesn't comprise encapsulation using HTTP protocol (once TCP encapsulation has been executed). In any communication system, when a sender prepares data for sending from its physical interface (e.g., wired/wireless interface of the server/machine), the process of entire "data formulation" or "data construction" has multiple steps, all steps (if they are present) are associated with one layer of OSI model (it's a model which every communication system follows, some specification communication schemes may have lower number of layers (because multiple layers of OSI can be combined into one for those cases). Two lower level layers—data link layer and physical layers are invariably present in any communication system. They are the lowest two layers. They reside beneath the TCP layer. Data link layer ensure error free communication whereas the physical layer processes the data so that it can be sent using the actual medium of communication (e.g., modulation and formatting in wireless/wired communication system)

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 **Does HLS use TCP or UDP as its transport protocol?** TCP and UDP are transport protocols, meaning they are responsible for delivering content over the Internet. TCP tends to deliver data more reliably than UDP, but the latter is much faster, even though some data may be lost in transit. Because UDP is faster, some streaming protocols use UDP instead of TCP. HLS, however, uses TCP. This is for several reasons: 1. HLS is over HTTP, and the HTTP protocol is built for use with TCP (with some exceptions). 2. The modern Internet is more reliable and more efficient than it was when streaming was first developed. In many parts of the world today, user connectivity has vastly improved, especially for mobile connections. As a result, users have enough bandwidth to support the delivery of every video frame. 3. Adaptive bitrate streaming helps compensate for the potentially slower data delivery of TCP. https://www.cloudflare.com/learning/video/what-is-http-live-streaming/

Preliminary charts based on best available information

7,848,328	Imagine Learning (“Accused Instrumentality”)
	 **HyperText Transfer Protocol (*HTTP*)** The HyperText Transfer Protocol, or *HTTP*, must be the most widely used Application layer protocol in the world today. It forms the basis of what most people understand the Internet to be—the World Wide Web. Its purpose is to provide a lightweight protocol for the retrieval of HyperText Markup Language (*HTML*) and other documents from Web sites throughout the Internet. Each time you open a Web browser to surf the Internet, you are using *HTTP* over *TCP/IP*. *HTTP* was first ratified in the early 1990s and has been through three main iterations: • **HTTP/0.9:** A simplistic first implementation of the protocol that only supported the option to get a Web page. • **HTTP/1.0:** Ratified by the *IETF* as RFC 1945 in 1996. This version added many supplemental data fields, known as *headers* to the specification. This allowed for other information passing between the client and server, alongside the request and consequent page. • **HTTP/1.1:** Defined in RFC 2068 by the *IETF*, version 1.1 implemented a number of improvements over and above the 1.0 specification. One of the main improvements of 1.1 over 1.0 was the implementation of techniques such as persistent *TCP* connections, pipelining, and cache control to improve performance within *HTTP*-based applications. https://www.informit.com/articles/article.aspx?p=169578

7,848,328	Imagine Learning ("Accused Instrumentality")
	Upper and Lower layers further divide network architecture into seven different layers as below - Application - Presentation - Session - Transport - Network, Data-link - Physical layers HTTP resides at application layer  Software /Upper Layers Heart of OSI Hardware /Lower Layers Application To allow access to network resources Presentation To translate, encrypt and compress data Session To establish, manage, and terminate session API, Sockets, WinSock Transport To provide reliable process to process message delivery and error delivery Network To move packets from source to destination To provide internetworking Data Link To organize bits into frames To provide hop-to-hop delivery Physical To transmit bits over a medium To provide mechanical and electrical specifications Coax, Fiber, Wireless, Hubs, Repeaters Sender Receiver © guru99.com TCP resides at Transport layer Network Layers Diagram https://www.guru99.com/layers-of-osi-model.html https://www.cloudflare.com/learning/ddos/glossary/open-systems-interconnection-model-osi/